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### **FOREWORD**

This document, D2-14934-2, entitled "WS-133A Maintainability Progress Report", is submitted to BSD/STL in accordance with the requirements of Technical Directive 62-4488, "Maintainability Requirement Program," dated 28 May 1962.

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PAGE 3

### REFERENCES

- a. MIL-M-26512B, Maintainability Requirements for Aerospace Systems and Equipment," dated 23 March 1962.
- b. 6120-7822-DU-RDI, "Maintainability Criteria, Preliminary," dated 16 March 1962.
- c. T.D. 62-4488, 'Maintainability Requirements Program', dated 28 May 1962.
- d. CCN 448, dated 28 May 1962.
- e. CCP 803, dated 5 October 1962.
- f. D2-14475, "WS-133A Maintainability Program Plan."
- g. D2-4747-1, "Maintainability Design Criteria for Minuteman Electronic Equipment."
- h. D2-4747-2, "Maintainability Design Criteria for Minuteman Transportation and Handling Equipment."
- i. D2-4747-3, "Maintainability Design Criteria for Minuteman Facilities and Facilities Equipment."
- j. Boeing letter 2-5261-2-249, dated December 20, 1962, with enclosure, List of WS-133A Equipment Selected for Maintainability Demonstrations."

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### 1.0 SCOPE

This document constitutes The Boeing Company's monthly status report to the Air Force on Maintainability Activities pertaining to the WS-133A Minuteman Weapon System. The Maintainability Program is a contractual obligation of The Boeing Company under CCN 448 of Contract Number AF 04(648)-289.

### 2.9 PURPOSE

The Air Force has requested that The Boeing Company develop Maintainability Criteria and conduct a Maintainability Program in accordance with this criteria. This is being accomplished in accordance with the WS-133A Maintainability Program Plan (D2-14475) based on the requirements set forth in MIL-M-26512B as amended by Technical Directive 62-4488.

The purpose of this document is to report to the appropriate Air Force agencies the progress achieved in execution of the Maintainability Plan and to detail the work accomplished during the reporting period.

### 3.) INTRODUCTION

This document is the second of the monthly reports that outline the progress achieved by the contractor in the WS-133A Maintainability Program. The first report covered the period from 18 October 1962 thru 31 December 1962. This report covers the period from 1 January 1963 to 31 January 1963. Each succeeding report will cover a monthly period from the first thru the last day of each month.

The Maintainability Program Plan for the Minuteman Weapon System is two-fold; it provides both a Design Review and Evaluation Plan and a Test and Demonstration Plan. The monthly reports contain status of progress and problem areas encourtered in each of these plans.

### 4.0 MAINTAINABILITY REVIEW AND EVALUATION

### 4.1 MAINTAINABILITY REVIEWS

### 4.1.1 Program

As part of the Maintainability (M) effort under CCP-803 and the WS-133A Maintainability Program Plan (D2-14475), specific figure "A" items are being reviewed for M and soldering in accordance with criteria as specified in 6120-7822-DU-RDI. Major M problem areas revealed by these reviews are reported through initiation of a Maintainability Action Request (MAR). Minor M problems of the product improvement type are reported to the Design Project through a Maintainability Review Report (MRR).

### 4.1.2 Figure "A" Items To Be Reviewed

- a. The following figure "A" items were selected by the customer for M review:
  - 1) 1207 Drier, Air Compressor;
  - 2) 1281 Fault Locator Set, AN/GSM-69;
  - 3) 1288 Battery, Storage;
  - 4) 1337 Distribution Box;
  - 5) 1338 Console, Communications Control;
  - 6) 1367 Motor/Generator, PU-521;
  - 7) 1380 Distribution Box;
  - 8) 1385 Distribution Box.
  - 9) 1412 Signal Assembly Voice Reporting;
  - 10) 1423 Antenna Group, AN/GRA-72;
  - 11) 1424 Antenna, AS-1213/GRC-113;
  - 12) 1425 Antenna System, H. F., Receiving & Transmitting;
  - 13) 1426 Antenna, H. F., Transmitting, Hardened;

### 4.1.2 (Continued)

- 14) 16.77 Security and Alarm Set;
- 15) 3007 Test-Set, Explosive Set Circuitry;
- 16) 3092 Test-Set, Programmer Group;
- 17) 4018 Adapter AN/GSM-61;
- 18) 4043 Elevator, Work Cage;
- 19) 4152 Test Equipment. Electrical Facility, Base Maintenance;
- 20) 4220 Test-Set, Relay;
- 21) 4252 CIV Set, AN/GSQ-65;
- 22) 4344 Fault Locator, SCN Cable;
- 23) 4451 Controller, Azimuth Drive;
- 24) 4487 Command Signal Simulator;
- 25) 4489 Message Generator;
- 26) 4490 Simulator Set, Electrical Functions;
- 27) 4491 Start-Up Unit;
- 28) 4515 Static Frequency Changer;
- 29) 4523 Common Power Supply;
- 30) 4539 Test-Set, VRSA;
- 31) 4601 Function Simulator, H.F./UHF Radio;
- 32) 4632 Test-Set, Electric Power, LF,
- 33) 4633 Test-Set, Electric Power, LCF.
- b. The Minutes of the Maintainability Review Meetings held at Boeing on 9 January 1962, and at RCA, on 16 January 1962 (file

### 4.1.2 (Continued)

No. 2-6331-0-366. dated 7 February 1962) listed certain figure "A" items which were not reviewed due to non-availability of hardware. These items are being reviewed on a schedule compatible with equipment availability.

c. Other figure "A" items are being reviewed as problem areas are identified by review of Field Service Reports, System Test Action Requests, Unsatisfactory Reports, M. Evaluation/Observation (E/O) Reports, and other field reports prepared by Boeing organizations.

### 4.2 MAINTAINABILITY ACTION REQUESTS (MAR)

During the reporting period the following MAR was initiated:

2-7724-Al. NCU Zero Alignment Test Set. BGS-116.

Status of all MAR's initiated to date is contained in the MAR Status Summary Chart (See Section 6.2).

### 4.3 MAINTAINABILITY REVIEW REPORTS (MRR)

During the reporting period MRR's on the following equipments were completed:

- a) Common Power Supply, figure A 4523;
- b) Alarm Set Test Set. Figure A 3109;
- c) MGE Electrical Equipment cases, MGE Figure A's;
- d) Distribution Box J-1269, Figure A 1337;
- e) Voice Reporting Signal Assembly Figure A 1412;
- f) HSM-80C Section 49 skirt;
- g) Distribution Box J-1312, Figure A 1380;
- h) Test Set. Explosive Set Circuitry, Figure A 3007.

The MRR's have been forwarded to the cognizant design group for consideration as product improvement items. (See Maintainability Review Status Summary Chart Section 6.1).

### 4.4 FIELD LIAISON REPORTS

Surveillance of operational activities to obtain additional Maintainability data is being accomplished thru review of STAR's (Systems Test Action Requests), FSR's (Field Service Reports), UR's (Unsatisfactory Reports), and BIAR's (Base Installation Action Requests). During the reporting period, twelve (12) STAR's, five (5) FSR's, and eight (8) BIAR's have been reviewed for Maintainability implications. Certain of these reports will be followed by M Engineers to ascertain that the reply/action satisfactorily solves the problem. MAR/MRR action will be initated on those reports requiring additional Maintainability consideration.

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### 5.0 MAINTAINABILITY TEST AND DEMONSTRATION

### 5.1 TEST AND DEMONSTRATION PLAN

- a. Tests and performance demonstrations already scheduled for other purposes at the STP III installation, Vandenberg Air Force Base, and Minuteman Wing installation are being utilized to provide as many Maintainability demonstrations as possible. Maintainability Engineers are participating in those tests and demonstrations which have inherent Maintainability significance, and are documenting their observations.
- b. Items of equipment whose Maintainability features have a major impact upon the operation and maintenance of the Weapon System have been selected. Only demonstrations involving these items are being documented, pending both BSD approval of the equipment list and contractual coverage for any additional tests considered necessary by the Customer.

### 5.2 TEST AND DEMONSTRATION EQUIPMENT LIST

- a. The "List of WS-133A Equipment Selected for Maintainability Demonstrations" was transmitted to BSD by letter 2-5261-2-249, dated December 20, 1962. This list identified applicable maintenance operations which may be observed during remaining scheduled test and demonstration activities, to provide Maintainability demonstrations of the selected Figure "A" equipment items. It also identified, for each selected equipment item, those maintenance operations which should be demonstrated but were not at that time known to be included within any scheduled test or demonstration.
- b. The "Demonstration Requirements Status Summary" (Section 6.3 of this report) provides monthly amplification and updating of the "List of WS-133A Equipment selected for Maintainability Demonstrations." It contains a tabulation of the maintenance operations which should be demonstrated for each selected "Figure A" equipment item, and identifies any scheduled events which are known to include these operations. It also contains a completion record, which provides completion dates and observer report numbers for all demonstrations which have been accomplished during current and previous reporting periods.
- c. Maintainability Engineers will continue to participate in the scheduled demonstration events listed in the "Demonstration Requirements Status Summary." pending further direction from BSD.

### 5.3 MAINTAINABILITY EVALUATION/OBSERVATION (E/O) REPORTS

E/O Reports are prepared for both "dynamic" observations of maintenance and static evaluations of M design. The Maintainability E/O's provide the basis for subsequent corrective action on the noted problems, and are submitted in this Progress Report as a demonstration record.

- a) Static" evaluations are complete visual inspections made on a non-interference basis whenever equipment becomes conveniently available. "Dynamic" observations are made during applicable maintenance operations using actual equipment. In either case the E/O Reports document the demonstration results.
- b) Each completed E/O Report is evaluated by the Maintainability Engineers who have Maintainability-review responsibility for the specific "Figure A litems of equipment identified in the report. When Maintainability deficiencies are identified in the E/O, MAR's and/or MRR's are initiated for appropriate action.
- c) Seven E/O Reports were written during the report period covered by this document. They were prepared by the Maintainability Engineers who participated in the M demonstrations. The reports are contained in Section 6.4.

### 6.0 REPORTS

This section contains status charts, copies of Maintainability Action Requests (MAR's), and Maintainability Evaluation Observation (E O) Reports.

### 6.1 MAINTAINABILITY REVIEW STATUS SUMMARY

The Maintainability Review Status Chart contains an up-to-date summary of all Figure A equipments reviewed in accordance with the discussion contained in Section 4. As additional Figure A items are reviewed they will be entered on this chart with notations as to action taken and date review is completed. This chart will be revised and reproduced in each succeeding monthly status report.

# MAINTAINABILITY REVIEW STATUS CHART

(

| Figure "A" NO. SUBJECT  1367  1282/1288  1243/1338  Consoles (telephone & transmitte Antenna Set At Be Battery Storage 1248  1269  1283  Antenna Set Code Inserter-Verifier Set Lighting Equipment Group Programmer Group Common Power Supply Alarm Set Test Set Various Electrical Equipment Cases, MG Distribution Box, J-1296  1337  Voice Reporting Signal Assembly HSM-80C Section 49 Skirt Distribution Box, J-1312  3007  Test Set, Explosive Set Circuitry | <u></u>                |           |         |                   |
|--|------------------------|-----------|---------|-------------------|
| Motor-Generator, Pl Battery Storage Consoles (telephone Antenna Set Decoder Kit Motor-Generator, Pl Code Inserter-Verifi Lighting Equipment Programmer Group Common Power Supp Alarm Set Test Set Electrical Equipmen Distribution Box, J-1 Voice Reporting Sign HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive S  |                        | MAR NO.   | MRR NO. | COMPLETED         |
| Motor-Generator, Pl Battery Storage Consoles (telephone Antenna Set Decoder Kit Motor-Generator, Pl Code Inserter-Verifi Lighting Equipment (Programmer Group Common Power Supp Alarm Set Test Set Electrical Equipmen Distribution Box, J-1 Voice Reporting Sign HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive S   |                        |           |         |                   |
| 1338 Consoles (telephone Antenna Set Decoder Kit Motor-Generator, Pl Code Inserter-Verifi Lighting Equipment (Programmer Group Common Power Supp Alarm Set Test Set Electrical Equipmen Distribution Box, J-1 Voice Reporting Sign HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive 8  | U-521 (LCF)            |           | 1-1367  | December 14, 1962 |
| Antenna Set Decoder Kit Motor-Generator, Pl Code Inserter-Verifi Lighting Equipment ( Programmer Group Common Power Supp Alarm Set Test Set Electrical Equipmen Distribution Box, J-1 Voice Reporting Sign HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive 8  |                        | 3-1282-A1 | 2-1282  | December 14, 1962 |
| Antenna Set Decoder Kit Motor-Generator, Pl Code Inserter-Verifi Lighting Equipment of Programmer Group Common Power Supp Alarm Set Test Set Electrical Equipmen Distribution Box, J-1 Voice Reporting Sign HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive 5   | & transmitter control) |           | 3-1243  | December 14, 1962 |
| Decoder Kit Motor-Generator, Pt Code Inserter-Verifi Lighting Equipment C Programmer Group Common Power Supp Alarm Set Test Set Electrical Equipment Distribution Box, J-1: Voice Reporting Sign HSM-80C Section 49 Distribution Box, J-1: Test Set, Explosive S   |                        |           | 4-1369  | December 14, 1962 |
| Motor-Generator, Pt<br>Code Inserter-Verifi<br>Lighting Equipment C<br>Programmer Group<br>Common Power Supp<br>Alarm Set Test Set<br>Electrical Equipment<br>Distribution Box, J-1:<br>Voice Reporting Sign<br>HSM-80C Section 49<br>Distribution Box, J-1:<br>Test Set, Explosive S  |                        |           | 5-4488  | December 14, 1962 |
| Code Inserter-Verifi Lighting Equipment C Programmer Group Common Power Supp Alarm Set Test Set Electrical Equipment Distribution Box, J-1 Voice Reporting Signi HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive S  |                        | 1-1283-A1 | 6-1283  | 21,               |
| Lighting Equipment C Programmer Group Common Power Supp Alarm Set Test Set Electrical Equipment Distribution Box, J-1 Voice Reporting Sign: HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive S   | ir Set                 |           | 7-4252  | December 21, 1962 |
| Programmer Group Common Power Supp Alarm Set Test Set Electrical Equipment Distribution Box, J-1 Voice Reporting Signi HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive S  | Group                  |           | 8-1370  | 21.               |
| Common Power Supp<br>Alarm Set Test Set<br>Electrical Equipment<br>Distribution Box, J-1<br>Voice Reporting Sign<br>HSM-80C Section 49<br>Distribution Box, J-1<br>Test Set, Explosive S   |                        |           | 9-1201  | December 21, 1962 |
| Alarm Set Test Set Electrical Equipment Distribution Box, J-1 Voice Reporting Sign HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive S  | <b></b>                |           | 10-4523 | December 24, 1962 |
| Distribution Box, J-1 Voice Reporting Signing HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive S   |                        | •         | 11-3109 | ဖ်                |
| Distribution Box, J-1 Voice Reporting Signs HSM-80C Section 49 Distribution Box, J-1 Test Set, Explosive S   | Cases, MGE             |           | 12-MGE  | January 18, 1963  |
|  | 1296                   |           | 13-1337 | January 23, 1963  |
|  | l Assembly             |           | 14-1412 | January 21, 1963  |
|  | Skirt                  |           | 15-6950 | January 22, 1963  |
|  | 12                     |           | 16-1380 | January 23, 1963  |
|  | et Circuitry           |           | 17-3007 | 29,               |
|  |                        |           |         |                   |
|  | •                      |           |         |                   |
|  |                        |           |         |                   |
|  |                        |           |         |                   |
|  |                        |           |         |                   |
|  |                        |           |         |                   |

### 6.2 MAR STATUS SUMMARY

The MAR Status Chart contains up-to-date list of MAR's issued and the current status of each MAR. Copies of MAR's will be included in each monthly status report until such time as they are considered closed. MAR's requiring no further consideration by either the originating engineer or the organization responsible for corrective action will be closed. This status is assigned by the MAR originator only when one of the following has been achieved:

- a) An authorized hardware, procedure, specification or other corrective action has been found to satisfy the MAR problem;
- b) The organization responsible for action rejects the request for corrective action and the MAR originator concurs with reasons given for the rejection;
- c) The MAR originator considers that the MAR requires no further action because of related actions taken, events occurring, or status changing after initiation of the MAR.

## MAR STATUS CHART

| MAR NO                              | SUBJECT  | Date Issued  | STATUS   |
|-------------------------------------|--|--|----------|
| 1-1283-A1<br>2-7724-A1<br>3-1282-A1 | DC Drive Motor Disconnect<br>NCU Zero Alignment Test Set<br>Launch Facility Battery Shock Mounts | To be issued<br>January 22, 1963<br>December 5, 1962 | In Work* |
|                                     |  |  |          |
|                                     |  |  |          |
|                                     |  |  |          |
|                                     |  |  |          |
| MAR copies im                       | copies immediately follow this chart.  |  |          |

### MAINTAINABILITY ACTION REQUEST

WS-133 WEAPON SYSTEM



The Boeing Company Aero-Space Division Seattle Washington MAINTAINABILITY GROUP

Organization 2-5261-30

**50-66** °

JU6-6263

ROUTING

ACTION: Kazuo Kobauaski ORGAN. 2-6433 42-93 M.S.

CC: Dan Ranney 14-01

1 of 3 PAGE

MAR No. 2-7724-A1

DATE: 22 January 1963

DATE REPLY DUE:

5 February 1963

PERCENT A NO. 7724

Mall Stop

Telephone

SYSTEM Nozzle Control Unit SUBSYSTEM BGS-116 Test Set

### Statement of Problem:

Failure of the connector/cable on the NCU Zero Alignment Test Set, which is returned to Boeing Seattle for repair, is affecting Plant 77 capability for maintenance of the NCU.

### Factors of Problem:

- The connector which mates with the NCU is "molded" to the cable which 1. connects the NCU to the test set and proper facilities to do this molding are not available at Plant 77.
- Spares Provisioning, organization 2-5274, can not authorize an entire 2. figure A as a spare.
- The cable is not provided as a spare; Drawing \* 25-26801 calls out separe 3. ate components to make up this cable.
- Six of these figure A items have been sent from Plant 77 to Boeing for 4. repair. One unit has been returned to Plant 77 after 75 days turn-around time and the others are still at Boeing after 25 days.
- The test sets have a high usage factor. BIAR-Plant 77-130T, December 12, 5. 1962, states "connectors become damaged thru constant normal usage."

### Discussion:

The connector mates with a connector on the NCU and, if a damaged test set connector is used, resultant damage to the NCU connector requires that the NCU be returned to Autonetics for repair. Plant 77 has been unable to mold

| Minuteman Finance J. Niederkrome | Minutema<br>R. B. Gro | be A. State |
|----------------------------------|-----------------------|-------------|
| M Engineers (c)                  | Approved by Sheware   | Approved by |
| E. Hardy                         | J. S McEacheran       | 70 14004 0  |

### ·Discussion(Continued)

or pot the connector to the cable. This molding is required because test so is used in a hazardous area.

The current high failure rate for this test set plus the lengthy turn-around time requires that a change be made in the present repair concept or that the quantity authorized at Plant 77 be increased for this figure A.

NOTE: Since the cost of this figure A is only \$790, increased authorization for this item at Plant 77 can be provided at a relative low cost; therefore a cost study will not be made. The problem here is not costs but that a new tenance bottleneck is to be prevented.

### Recommendation:

Redesign of the connector/cable to make it replaceable at Plant 77.

### Note:

This is a preliminary cost study to assertain if the M proposal will result in a savings to the costomer. Values used are gross figures and do not constitute official Boeing cost estimates. Their use is limited to planning purposes and tradestudies for this M proposal.

| $\triangle$  | <u>M</u> A I1  | NTAINABILITY ACTION REI<br>WS-133 WEAPON SYSTEM  | QUEST           |
|--|--|--|-----------------|
| Aero-Spa<br>Seattle<br>MAINTAINA<br>Organizati<br>Mail Sta | ing Company ace Division Washington BILITY GROUP on 2-5261-30 op 50-66 | ROUTING  ACTION: F. L. Strum  ORGAN, H&D Power Unit  M.S. 52-26  CC: K. Niebsuer 52-26  P. Koenig 52-9  J. M. Barker 50-66  D. A. Cole 43-86 | DATE REPLY DUE: |

SYSTEM Electrical

SUBSYSTEM Storage Battery

Statement of Problem:

Difficulty is being experienced in installing Launch Facility battery shock mounts at operational sites.

### References:

- (a) Parson Drawing SK-161
- (b) FSR No MAFB 341 SMW-53F
- (c) BSD Drawing SK-162

Field Service Report received from Malmstrom Air Force Base (reference b) reports considerable difficulty in installing Launcher battery shock mounts. This same difficulty can be expected whenever batteries must be moved or replaced during the life of the weapon system.

Investigation and review of an alternate mount such as that represented by BSD drawing SK-162 (reference c) indicates elimination of the installation and maintenance problem. Cost studies show that due to simplicity of design, an overall savings of approximately \$655,220 can be realized. This savings is based upon effectivity at Wing III. As the savings is approximately \$625 per Launch Facility, it is recommended that this change be effected as soon as possible.

Recommend ECP be processed to change shock mounts to ones similar to BSD drawing SK-162 (reference c).

|    | Minuteman Finance J. Niederkrome | ide                       | Minuteman Sy<br>B. B. Grobe | stem Analysis | Grobe |
|----|----------------------------------|---------------------------|-----------------------------|---------------|-------|
| ∑) | R. L. Stearns                    | Approved by:  J. S. McEsc | SMGacheran<br>beran         | Approved by:  |       |
|    |                                  | <del> </del>              |                             |               |       |

Figure A, forms B, C, C-1 changes Manufacturing changes Hardware changes Mandatory, "make-work" changes Customer directed Boeing initiated

### Safety and hazards Human factors (MIL-STD-803)

Schedule impact

Standardization & interchangeability

power, GFE, test equipment, etc.)

Interfaces and accordary faults

Compatibility (PAS, 465L, radio nets,

### COST SUMMARY

| R&D  | Cost<br>\$ 50,000 | Savings          |
|--|-------------------|------------------|
| Publications & Drawings                        | 5,000             |                  |
| Form C   | 2,000             |                  |
| Cost of modifying batteries #17.00/unit        | •                 |                  |
| 12 units/LF, 150 LF/wing & 7 wings             |                   |                  |
| (Wings III through IX)                         |                   | • •              |
| Total cost of battery change \$17X12X150X7     | 214,200           |                  |
| Old shock mount \$1800 for material/unit       |                   |                  |
| 240 manhours for manufacture.                  |                   |                  |
| New shock mount \$1800 for material/unit       |                   | •                |
| 184 manhours (56 less manhours) #10.00/hr.     |                   |                  |
| 150 LF/wing & 7 wings                          |                   |                  |
| 56X #10X13X150X7 = Manufacturing savings       |                   | <b>#</b> 588,000 |
| Savings of 2 manhours per unit on installation | n                 |                  |
| at #12.40/hr.                                  |                   |                  |
| #12,40X2X13X150X7 =                            |                   | 338,420          |
| Totals   | 9-271,200         | <b>#926,42</b> 0 |
| Net Savings                                    |                   | \$655,220        |

### Note:

This is a new iminary cost study to assertain if the M proposal will result in a saving to the customer. Values used are gross figures and do not constitute official Bosing (Constitute official Bosing) estimates. Their use is limited to planning purposes and trade studies for this M proposal.

### 6.3 DEMONSTRATION REQUIREMENTS STATUS SUMMARY

The following Demonstration Requirements Status Summary contains an up-to-date summary of scheduled maintainability demonstration events for each selected "Figure A" equipment item, including completion dates and E/O Report numbers for those demonstrations which have occurred during the current and previous reporting periods. The Summary also lists those maintenance operations which should be demonstrated but are currently 'unscheduled."

| Checkout   Complete   Complete   Technical Approval Demontals, Malmstrom AFB   | FIGURE A              | MAINTENANCE OPERATION | DEMONSTRATION EVEN                                    |
|--|-----------------------|-----------------------|---|
| 1-18, Malmstrom AFB     Organizationsi)   Level Fault   Isolation     Field-Level   Drawer Al   Checkout     Orawer A2   Verification, T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     (Part No44)   Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     (Part No50)   Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     (Part No50)   Verification: T. O. 31X3-1     Telephical Approval Demon 1-14, Malmstrom AFB     (Part No50)   Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     (Part No50)   Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Technical Approval Demon 1-14, Malmstrom AFB     Verification: T. O. 31X3-1     Technical Approval Demon 1-14, Malmstrom AFB     Technical Approval Demon 1-14, Malmstrom         | (301 Programmer Group |                       | Verification; T. O. 21-SM80A-par. 2-28 thru fig. 2-34 |
| 1-18, Malmstrom AFB   1-18, Malmstrom AFB   1-18, Malmstrom AFB   Verification, T. O. 31X3-1   7-11, 7-12A, 7-13   Technical Approval Demos 1-14, Malmstrom AFB   Verification: T. O. 31X3-1   7-12A, 7-13   Verification: T. O. 31X3-1   7-12A, 7-13   (Part No50)   Verification, T. O. 31X3-1   7-12A, 7-13   Verification, T. O. 31X3-1   (Part No49)   Verification, T. O. 31X3-1   7-12A, 7-13   Verification: T. O. 31X3-1   7-12A, 7-13   T-12A, 7-13 |                       | Complete              | Technical Approval Demonstrat                         |
| Drawer A2  |                       | i ii                  | Technical Approval Demonstrat                         |
| (Part No44)  (Part No44)  (Part No50)  (Part No50)  (Part No50)  (Part No51)  (Part No51)  (Part No49)  (Part No49)  (Part No49)  (Part No56)  (Part No57)   |                       | 7                     | Verification, T.O. 31X3-12 8-2<br>7-11, 7-12A, 7-13   |
| (Part No50) Verification, T. O. 31X3-1 (Part No51) Verification, T. O. 31X3-1 (Part No49) Verification, T. O. 31X3-1 (Part No56) Verification, T. O. 31X3-1 (Part No56) Verification; T. O. 31X3-1 7-12A, 7-13  Drawer A4 Verification, T. O. 31X3-1   |                       | Drawer A2             | Technical Approval Demonstrat                         |
| (Part No51) Verification, T. O., 31X3-1 7-12A, 7-13  Drawer A3 (Part No49) Verification, T. O., 31X3-1 (Part No56) Verification; T. O., 31X3-1 7-12A, 7-13  Drawer A4 Verification, T. O., 31X3-1  | •                     | (Part No44)           | Verification: T. O/ 31X3-12-8-17-12A, 7-13            |
| Drawer A3 (Fart No49) 7-12A, 7-13 Verification, T. O. 31X3-1 (Part No56) Verification; T. O. 31X3-1 7-12A, 7-13 Verification, T. O. 31X3-1   |                       | (Part No50)           | Verification, T. C. 31X3-12-8-7-12A, 7-13             |
| (Fart No49)   7 12A, 7-13  |                       | (Part No51)           |   |
| Drawer A4 Verification, T.O. 31X3-1  |                       | · ·                   | Verification, T. O., 31X5-12-8-7-12A, 7-13            |
|  |                       | (Part No. >56)        | Verification; T. O. 31X3 42-8-7-12A, 7-13             |
| (Part No56) 7-12A, 7-13  |                       |                       | Verification, T. O. 31X3-12-8-7-12A, 7-13             |
| (Part No. 62)   Verification, T. C. 51X3-17-12A, 7-13  |                       | (Part No. 62)         | Verification, T. C. (31X3-12/8-)<br>7-12A, 7-13       |
| (Part No40)   Verification, T. O11X3-1   | •                     | 1                     | Verification, 7, 0, 41X3-12-8-11-47 thro 11-27        |
| (Part No. 150)   Verdication, 1 0. 3183,1  |                       | (Part No50)           | Vermeat.m, 1 0. 3:X3-12-8-                            |
| Drawer A7 Verification, T. O. 21X 5-1 12-15 thru 12-19   |                       | Drawer A7             | Verification, T. O. 21X3-12-8-<br>12-15 thru 12-19    |

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|   | COMPLETION RECORD |          |      |                            |           |         |  |  |  |
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| ification; T. O. 21-SM80A-2-3,<br>2-28 thru lig. 2-34 |                   |          |      |                            |           |         |  |  |  |
| hnical Approval Bemonstration  Malmstrom AFB          | 11-7-62           |          |      |                            | EO-1201-1 | 1-18-63 |  |  |  |
| hnical Approva: Demonstration  Malmatrom AFB          | 11-7-62           |          |      |                            | EO-1201-1 | 1-18-63 |  |  |  |
| fication, T.O. 31X3-12-8-2, par<br>, 7-12A, 7-13      |                   |          |      |                            |           |         |  |  |  |
| hnical Approval Demonstration  1, Malmstrom AFB       |                   |          |      | ľ<br>H                     |           |         |  |  |  |
| dication: T. O. 31X3-12-8-2, par. 2A, 7-13            |                   |          |      |                            |           |         |  |  |  |
| alication; T. O. 31X3-12-8-2, par 2A, 7-13            |                   |          |      |                            |           |         |  |  |  |
| nication, T.O., 31X3-12-8-2, par. 2A, 7-13            |                   | •        |      |                            |           |         |  |  |  |
| dication, 1 O, SIX5-12-8-2, par. 2A; 7-13             |                   |          |      |                            |           |         |  |  |  |
| incation; T. O. 34X3-12-8-2, par. 2A, 7-13            |                   |          | •    | 1<br>1<br>1                |           |         |  |  |  |
| africation, T. O. (183-12-8-2) part. 2A, 7-13         |                   |          |      |                            | . •       |         |  |  |  |
| ification, T. O. 21X3-12-8-2, par. 2A, 7-13           |                   |          |      | 1<br>1<br>1<br>1<br>1<br>1 |           | •       |  |  |  |
| itication, 1, 0, (1X3/12/8/2) par. (17 thr. 11/17)    |                   |          |      |                            |           |         |  |  |  |
| arcat on, 1 (), ± N3-12-8-2, par. 17 thru 11 (2)      |                   |          |      |                            |           |         |  |  |  |
| itication; T. O. 31X3-12-8-2, par. 15 thru 12 (9)     |                   |          |      |                            | Z         |         |  |  |  |
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| FLOURE A                     | MAINTENAN                                | NCE OPERATION                                 | DEMONSTRATION EVENT                                  |
|------------------------------|--|---|--|
|                              | Field-Level<br>Fault isolation           | Drawer Al                                     | UNSCHEDULED  |
| ·                            |  | Drawer A2                                     | Technical Approval Demonstration 1-14, Malmstrom AFB |
|                              |  | Drawer A3                                     | UNSCHEDULED  |
| •                            |  | Drawer A4                                     | UNSCHEDULED  |
|                              |  | Drawer A6                                     | UNSCHEDULFD  |
|                              |  | Drawer A7                                     | UNSCHEDULED  |
| 1211 Laurel Facility         | Organizationa:-                          | Leve) Checkout                                | UNSCHEDULED  |
| Fry rommental Control System | Organ, zat. onat-<br>Isolation           | Level Fault                                   | UNSCHEDULED  |
|                              | Organizationali<br>Level Adjusts<br>ment | Dampers D 1, D 2  Dampers D 3, 1 - 3A, D - 3B | UNSCHEDULED UNSCHEDULED                              |
|                              |  | Damper D. 4                                   | UNSCHEDULED  |
|                              |  | Damper D-5                                    | UNSCHEDULED  |
|                              |  | 8 tches Pl 2,<br>PF 3, PF 4                   | UNSCHEDULED  |
|                              |  | Seatch PF 5                                   | UNSCHEDULED  |
|                              |  | Pressure<br>Regulator PC 1                    | UNSCHEDULED  |
|                              |  | Flor Sensor FA-4                              | UNSCHEDULED  |
|                              |  | Flow Sensor FA 2                              | UNSCHEDULFD  |
| 1                            |  | Thermostat TC 1                               | UNSCHEDULED"   |
|                              |  | Thermostat 16-4                               | UNSCHEDULED  |

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| chnical Approval Demonstration<br>14, Malmstrom AFB |                   |          |           |           | •        |      |  |
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|   |   | DEMON                        | STRATION RED    | UIREMEN    |
|---|---|------------------------------|-----------------|------------|
| FIGURE A EQUIPMENT ITEM                           | MAINTENAN                                       | CE OPERATION                 | DEMONS          |            |
| 1211 Launch Facility Environmental Control System | Field-Level<br>Fault isolation                  | I                            | UNSCHEDULED     | a! Demonst |
|   |   | Drawer A2                    | 1-14, Malmstron |            |
|   |   | Drawer A3                    | UNSCHEDULED     |            |
|   |   | Drawer A4                    | UNSCHEDULED     | •          |
|   |   | Drawer A6                    | UNSCHEDULED     |            |
|   |   | Drawer A7                    | UNSCHEDULED     |            |
|   | Organizational-<br>Organizational-<br>Isolation | Level Checkout Level Fault   | UNSCHEDULED     | ·<br>•     |
| •   |   | Dampers D-1, D-2             | UNSCHEDULED     | •          |
|   | Level Adjust-<br>ment                           | Dampers D-3,<br>D-3A, D-3B   | UNSCHEDULED     |            |
|   |   | Damper D-4                   | UNSCHEDULED     | :          |
|   |   | Damper D-5                   | UNSCHEDULED     | ;<br>;.    |
|   |   | Scitches PE-2,<br>PF-3, PE-4 | UNSCHEDULED     | •          |
|   |   | Switch PE-5                  | UNSCHEDULED     |            |
|   |   | Pressure<br>Regulator PC-1   | UNSCHEDULED     |            |
|   |   | Flow Sensor FA-1             | UNSCHEDULE      |            |
|   |   | Flow Sensor FA-2             | UNSCHEDULED     |            |
|   |   | Thermostat TC-1              | UNSCHEDULED     |            |
|   |   | Thermostat TG-4              | UNSCHEDULED     |            |
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|   |                         | ·                              |              |  |
|---|-------------------------|--------------------------------|--------------|--|
| FIGURE A EQUIPMENT ITEM                 | MAINTENAN               | ICE OPERATION                  | DEMONST      | MATION EVEN  |
|   |                         | Thermostat TG-5                | UNSCHEDULED  |  |
|   |                         | Thermostat HL-1                | UNSCHEDULED  |  |
| ·                                       |                         | Thermostats TA-1,              | UNSCHEDULED  |  |
| , · · · · · · · · · · · · · · · · · · · |                         | Thermostats TA-2,              | UNSCHEDULED  |  |
|   |                         | Thermostat TA-4                | UNSCHEDULED  | **************************************   |
|   |                         | Low Temp. Cutout               | UNSCHEDULED. | •  |
|   |                         | Oil Pressure<br>Cutout         | UNSCHEDULED  |  |
|   | •                       | Pressure Reg.<br>PRV-2         | UNSCHEDULED  |  |
| ,                                       |                         | Restrictors                    | UNSCHEDULED  |  |
|   |                         | Brine Balancing                | UNSCHEDULED  |  |
|   |                         | Air Flow<br>Balancing          | UNSCHEDULED  |  |
|   |                         | Emerg. Water<br>Flow Balancing | UNSCHEDULED  | The state of the s |
| ·                                       | Organizational-         | Pressure Gage                  | UNSCHEDULED  | •  |
|   | l                       | Temperature<br>Gage            | UNSCHEDÜLED  | :<br>- ·   |
|   | Field-Level<br>Checkout | Chiller Unit                   | UNSCHEDULED  |  |
|   | Checkout                | Emerg. Cooling<br>Unit         | UNSCHEDULED  | \$ 14 \$ 2.1<br>14 \$ 2.1  |
| . <b>'</b>                              |                         | Misc. Components               | UNSCHEDULED  |  |
|   |                         |                                |              |  |

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| FIGURE A EQUIPMENT ITEM | MAINTENA                  | INCE OPERATION         | DEMONS       | RATION EVE |
|-------------------------|---------------------------|------------------------|--------------|------------|
|                         | Field-Level               | Chiller Unit           | UNSCHEDULED  |            |
| •                       | Fault<br>Isolation        | Emerg Cooling<br>Unit  | UNSCHEDULED  |            |
|                         |                           | Misc. Components       | UNSCHEDULED  |            |
|                         | Field-Level<br>Adjustment | High Pressure Cutout   | UNSCHEDULED. |            |
|                         |                           | Low Pressure<br>Cutout | UNSCHEDULED  |            |
|                         |                           | Oil Pressure<br>Cutout | UNSCHEDULED  |            |
|                         |                           | Low Temp, Cutout       | UNSCHEDU LÉD | •          |
|                         |                           | Damper D-1             | UNSCHEDULED  | •          |
|                         |                           | Damper D-2             | UNSCHEDULED  | • •        |
|                         |                           | Switches PE-2, PF-3    | UNSCHEDULED  | ·<br>·     |
|                         |                           | Pressure Reg.<br>PC-1  | UNSCHEDULED  |            |
|                         |                           | Restrictor RS-1        | UNSCHEDULED  |            |
|                         |                           | Pressure Gage          | UNSCHEDULED  |            |
|                         |                           | Temp. Gages TG-4, TG-5 | UNSCHEDULED  |            |
|                         |                           | Restrictor RS-1A       | UNSCHEDULED  |            |
|                         |                           | Switch PR-5A           | UNSCHEDULED  |            |
|                         |                           | Switches PE-6A, PE-7A  | UNSCHEDULES  |            |
|                         |                           | Thermostat TA-3        | UNSCHEDULED  |            |
|                         |                           | , Thermostat HL-2      | UNSCHEDULED  |            |
|                         |                           |                        |              |            |

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|---|-----------------------------|-----------------|--|--------------------|
| FIGURE A<br>EQUIPMENT ITEM                | MAINTENA                    | nce operation   | DEMONS                                 | ATION BE           |
| 1213 Digital Data<br>Processing Equipment | Organizational<br>Checkout  | -Level Partial  | Revalidation; T. C<br>par. 2-36 thru 2 | 21E <b>N6</b> 01   |
| (LCF)                                     | j.                          | Complete        | UNSCHEDULED                            | **F, -             |
|   | Organizational<br>Isolation | -Level Fault    | UNSCHEDULED                            |                    |
|   | Field-Level<br>Checkout     | CV-1236 Drawer  | Verification; T. O. 8-5, 8-7           | 31 <b>X2-32-</b> , |
|   |                             | MX-3686 Drawer  | Verification; T.O. 8-5, 8-7            | 31×2-32-           |
|   |                             | MX-3687 Drawer  | Verification; T. G<br>8-5, 8-7.        | 31X2-32-           |
|   |                             | CV-1243 Drawer  | Verification; T.O. 8-5, 8-7            | 31X2-32-           |
| ·   |                             | CV-1237 Drawer  | Verification; T.O<br>8-5, 8-7          | 31X2-32-           |
|   |                             | MX-3742 Drawer  | Verification; T.O. 8-5, 8-7            | 3172-32-           |
| ·   |                             | MU-446 Drawer   | Verification; T. Q<br>8-5, 8-7         | 31X2-32-           |
|   |                             | CV-1249 Drawer  | Verification; T. O<br>8-5,. 8-7        | 31X2-32-           |
|   |                             | CV-1250 Drawer  | Verification T. O<br>8-5, 8-7          | 31X2-3Z-           |
|   | Field-Level                 | CV-1236 Drawer  | UNSCHEDULED                            |                    |
|   | Fault<br>Isolation          | MX-3686 Drawer  | UNSCHEDULED                            |                    |
|   |                             | MX-3687 Drawer  | UNSCHEDULED                            |                    |
|   |                             | CV-1245 Drawer. | UNSCHEDULED                            |                    |
|   |                             | CV-1237 Drawer  | UNSCHEDULED                            |                    |
|   |                             |                 |  |                    |

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| FIGURE A                               | MAINTENAN               | CE OPERATION              | DEMONSTA                            | nom Even                               |
|--|-------------------------|---------------------------|-------------------------------------|--|
|  |                         | **                        |                                     |  |
|  |                         | MX-3742 Drawer            | UNSCHEDULED                         | 10000000000000000000000000000000000000 |
|  | •                       | MU-446 Drawer             | UNSCHEDULED                         |  |
|  |                         | CV-1249 Drawer            | UNSCHEDULED                         |  |
|  | ·                       | CV-1250 Drawer            | UNSCHEDULED                         |  |
|  | Field-Level             | CV-1237 Drawer            | Verification; T. C.                 | 31X2-31-J                              |
|  | Adjustment              | System Checkout           | UNSCHEDULED'                        | , t                                    |
| 1214 Guidance Section<br>Liquid Cooler | Level Checkout          | Pump Package<br>Operation | Technical Approved                  | Demonsti<br>AFS                        |
| •                                      | Organizational-         | Level Fault               | UNSCHEDULED                         |  |
|  | 1                       | place Pumping             | Technical Approve                   | VS.M                                   |
|  | Field-Level<br>Checkout | Water Chiller             | Technical Approx                    | VED                                    |
| •                                      | ·                       |                           | Verification, T. C                  | 35 <b>2</b> 9-35                       |
|  |                         | Pumping<br>Assembly       | Technical Approx<br>1-15, Malmstrom | AFB                                    |
|  |                         |                           | Verification; T. O                  | 35E9-35                                |
|  | ·                       | Control Amplifie          | r Verification; T. C<br>3-30        | 35E9-35                                |
|  | Field-Level<br>Fault    | Water Chiller             | UNSCHEDULED                         |  |
|  | Isolation               | Pumping Assembly          | UNSCHEDULED                         |  |
|  |                         | Cantrol Amplific          | A ONSCHEDULED                       |  |
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| .O. 31X2-32-3-2, par. 13.4 |                   |          |      |           |        |          |  |  |  |
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| oval Demonstration         |                   |          |      |           |        |          |  |  |  |
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| . C. 35E9-35-1, par.       |                   |          |      |           |        |          |  |  |  |
| ova: Demonstration         |                   |          |      |           |        | •        |  |  |  |
| om AFB                     |                   |          |      |           |        |          |  |  |  |
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| FIGURE A  | MAINTENA                          | NCE OPERATION                        | DEMONS                               | MTION, NO              |
|---|-----------------------------------|--------------------------------------|--------------------------------------|------------------------|
| 1228 Status-Command Message Processing Group (LF) |                                   | - Level Checkout                     | Technical Aperson                    |                        |
| 4   | Organizational Isolation          | -Level Fault                         | Technical Approv                     | Demosate<br>AFB        |
|   | Field-Level<br>Checkout           | MC-3775 Drawer                       | Verification; T. Q<br>18-5, 18-7     | 31X2-32-3              |
|   |                                   | MX-3776 Drawer                       | Verification; T. Q. 18-5, 18-7       | 11×2-32-3              |
|   |                                   | CV-1254 Drawer                       | Verification; T. O. 18-5, 18-7       | 31X2-32-3              |
| ·   |                                   | KY-411 Drawer                        | Veritication; T. O. 8-5, 8-7         | 31 X 2 - <b>32</b> - 3 |
|   | Field-Level<br>Fault              | MC-3775 Drawer                       | UNSCHEDULED                          |                        |
|   | Isolation                         | MX-3776 Drawer                       | UNSCHEDULED                          |                        |
|   |                                   | CV-1254 Drawer                       | UNSCHEDULED                          |                        |
| ,   | ·                                 | KY-411 Drawer                        | UNSCHEDULED                          |                        |
| 1243 Launch Control -<br>Console                  |                                   | -Level Checkout                      | Technical Approv<br>1-20, Vandenberg | l Demonsti<br>AFB      |
|   | Organizational Isolation          | -Level Fault                         | UNSCHEDULED                          |                        |
|   | Field-Level<br>Checkout           | DC Power Filter - Assy               | Verification; T. 0:                  | \$1X3-3-9-             |
| •   |                                   | Telephone Xmtr.<br>Control           | Verification; T. O.                  | 31K3-3-9-              |
|   | Field-Level<br>Fault<br>Isolation | DC Power Filter Assy                 | UNSCHEDULED                          |                        |
| f   |                                   | Telephone Xmtr,<br>Control           | UNSCHEDULED                          |                        |
|   | Removal, Rep<br>Checkout of La    | lacement, and<br>tunch Control Panel | Technical Approx<br>1-18, Vandenbieg |                        |
|   |                                   |                                      |                                      |                        |

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| 0            | 31X2-32-3-2, par.           | ·         | ·         | •         |            |                            |    |
| Ο.           | 31 <b>X2-32</b> -3-2, par.  | 1         |           | :         | <b>4</b> . |                            |    |
| . О.         | 31X2-32-3-2, par.           |           |           |           | c.         |                            |    |
| . O.         | 31X2-32-3-2, par.           |           |           | ;         |            | h.                         | l  |
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| . <b>o</b> . | ≸1X3-3-9-2-1, par.          |           |           |           |            |                            |    |
| . O.         | 31 <b>K3-3-</b> 9-2-1, par. |           | ,         | •         |            |                            |    |
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| FIGURE A<br>EQUIPMENT ITEM      | MAINTENAN                        | ICE OPERATION  | DEMONSTRATION I                                     |
| 1251 Digital Data Group<br>(LF) | Organizational-                  | Level Checkout | Technical Approval Demon                            |
|                                 | Organizational-<br>Isolation     | Level Fault    | Technical Approval Demon                            |
|                                 | Field-Level<br>Checkout          | RT-646 Drawer  | Verification; T. O. 31X2-31<br>18-5, 18-7           |
|                                 |                                  | DT-252 Drawer  | Verification; T. O. 31X2-37<br>18-5, 18-7           |
|                                 | ,                                | MX-3772 Drawer | Verification; T. O., 31X2-32<br>18-5, 18-7          |
|                                 |                                  | MX-3773 Drawer | Verification; T. O. 31X2-32<br>8-5, 8-7             |
|                                 |                                  | CV-1253 Drawer | Verification; T. O. 31X2-32<br>8-5, 8-7             |
|                                 | Field-Level                      | RT-646 Drawer  | UNSCHEDULED   |
|                                 | Fault<br>Isolation               | DT-252 Drawer  | UNSCHEDULED   |
|                                 |                                  | MX-3772 Drawer | UNSCHEDULED   |
|                                 |                                  | MX-3773 Drawer | UNSCHEDULED   |
|                                 | ,                                | CV-1253 Drawer | UNSCHEDULED   |
|                                 | Field-Level<br>Adjustment        | RT-646 Drawer  | Verification; T. O. 31X2-32<br>29-8 thru Fig. 29-4  |
|                                 |                                  | DT-252 Dra er  | Verification, T. O. 31X2-32<br>19-10 thru fig. 19-6 |
| 1265 Digital Data Group<br>(LF) | Organizational<br>Level Checkout |                | Revalidation; T. O. 21-SM8(<br>2-36 thru 2-39       |
|                                 |                                  | Complete '     | UNSCHEDULED   |
|                                 | Organizational-<br>Isolation     | Level Fault    | UNSCHEDULED   |
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| . O.                | 31X2-32-3-2, par.               |           |           |          |           |  |            |
| `. O.               | 31X2-32-3-2, par.               |           |           |          |           |  |            |
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| FIGURE A<br>EQUIPMENT ITEM | MAINTENA                | NCE OPERATION  | DEMONSTRATION EVEN               |              |  |
|                            | Field-Level<br>Checkout | T-869 Drawer   | Verification; T. C<br>18-5, 18-7 | . 31X2-32-3- |  |
|                            |                         | R-1096 Drawer  | Verification; T. C<br>18-5, 18-7 | . 31X2-32-3- |  |
|                            |                         | AM-3159 Drawer | Verification; T. C<br>18-5, 18-7 | . 31X2-32-3- |  |
| •                          |                         | MX-3681 Drawer | Verification; T. O<br>18-5, 18-7 | . 31X2-32-3- |  |
|                            |                         | MX-3682 Drawer | Verification; T. C<br>18-5, 18-7 | 31X2-32-3-   |  |
|                            |                         | MX-3683 Drawer | Verification; T.O<br>18-5, 18-7  | 31X2-32-3-   |  |
| ·                          |                         | MX-3684 Drawer | Verification; T. 0               | 31X2-32-3.   |  |
| ,                          | •                       | MX-3685 Drawer | Verification; T. O. 18-5, 18-7   | 31X2-32-3    |  |
|                            |                         | 1D-979 Drawer  | Verification; T. Q<br>18-5, 18-7 | 31X2-32-3    |  |
|                            |                         | R-1131 Drawer  | Verification; T. O. 18-5, 18-7   | 31X2-32-3    |  |
|                            |                         | T-869 Drawer   | UNSCHEDULED                      |              |  |
|                            | Foult<br>Isolation      | R-1096 Drawer  | UNSCHEDULED                      |              |  |
|                            | •                       | AM-3159 Drawer | UNSCHEDULED .                    |              |  |
|                            |                         | MX-3681 Drawer | UNSCHEDULED                      |              |  |
|                            |                         | MX-3682 Drawer | UNSCHEDULED -                    |              |  |
|                            |                         | MX-3683 Drawer | UNSCHEDULED                      |              |  |
|                            |                         | MX-3684 Drawer | UNSCHEDULED                      |              |  |
|                            |                         | MX-3685 Drawer | UNSCHEDULED                      |              |  |
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| FIGURE A EQUIPMENT ITEM          | MAINTENAN                                   | NCE OPERATION              | DEMONST                                | MINON EVE          |
|----------------------------------|---|----------------------------|--|--------------------|
|                                  |   | ID-979 Drawer              | UNSCHEDULED                            |                    |
| ·                                |   | R-1131 Drawer              | UNSTHEDULED                            | •                  |
|                                  | Field-Level<br>Adjustment                   | T-869 Drawer               | Verification; T. O.                    | 31X2-32-3          |
|                                  |   | R-1096 Drawer              | Verification; T. O; 18-13 thru fig. 19 | 31 <b>X2-32-</b> 3 |
|                                  |   | AM-3159 Drawer             | Verification; T.O. 18-13 thru fig. 20  |                    |
|                                  |   | ID-979 Drawer              | Verification; T.O.                     | 31X2-32-1          |
|                                  |   | R-1131 Drawer              | Verification; T. O. 18-13 thru fig. 23 | 31 <b>X</b> 2-32-3 |
|                                  |   |                            |  |                    |
| 1283 Motor-Generator Set<br>(LF) | Organizational-                             | Level Checkout             | Verification; T. O.                    | 21-SM80A           |
|                                  | Organizational -<br>Isolation               | Level Fault                | UNSCHEDULED                            |                    |
|                                  | Organizational -<br>Adjustment              | Level Brush                | UNSCHEDULED                            |                    |
| •                                |   |                            |  |                    |
| 1284 Power Supply Set (LF)       | Organizational-<br>Level Checkout           | ••                         | Verification; T. O. 2-26               | 21~SM80A           |
|                                  |   | Relays                     | Verification; T. O. 2-27               | 21-5M80A           |
|                                  | Organizational-<br>Level Fault<br>Isolation | Voltage and Ckt.<br>Brkrs. | UNSCHEDULÉD                            |                    |
|                                  | Isolation                                   | Relays                     | UNSCHEDULED                            |                    |
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| O; 31X2-32-3-2, par.<br>19-7        | ,           |     |          |           |         |                  |
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| .O. 31 <b>X2-32-3-2, par</b> . 20-7 |             |     |          |           |         |                  |
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| •   |                                | UEMU             | NSTRATION REQUIREMEN                               |
|---|--------------------------------|------------------|--|
| FIGURE A EQUIPMENT ITEM                           | MAINTENA                       | ANCE OPERATION   | DEMONSTRATION EV                                   |
|   | Field-Level<br>Checkout        | Preparation      | Verification; T. O. 35C2-2-6<br>4-4, fig. 4-1      |
|   | (Fig. A 1284)<br>and 1289)     | PP-3026 Supply   | Verification; T.O. 35C2-2-6 fig. 4-2               |
| •   |                                | PP-3030 Supply   | Verification; T. O. 35C2-2-6                       |
|   |                                | PP.3027 Supply   | Verification; T. O. 35C2-2-6                       |
| •   | Field-Level                    | PP-3026 Supply   | UNSCHEDULED  |
|   | Fault Isolation                | PP-3030 Supply   | UNSCHEDULED  |
|   | (Fig. A 1284<br>and 1289)      | , PP-3027 Supply | UNSCHEDULED  |
| 1289 Power Supply Set<br>(LCF)                    | Organizationa                  | 1-Level Checkout | Verification; T. O. 21-SM80. fig. 1-10C            |
|   | Organizationa<br>Isolation     | l-Level Fault    | UNSCHEDULED  |
|   | Field-Level C                  | Checkout         | (See Fig. A 1284)                                  |
|   | Field-Level F                  | ault Isolation   | (See Fig. A 1284)                                  |
| 1296 Restricted Area Anti-<br>Intrusion Alarm Set | Organizationa<br>Level Checkon | •                | Verification; T. O. 21-SM80.<br>2-4A thru fig. 1-9 |
| ,   |                                | Inner Security   | Verification, T.O. 21-SM80.<br>2-4A thru fig. 1-9  |
|   |                                | Outer Security   | Verification; T. O. 21-SM80, 2-4A thru fig. 1-9    |
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|                       | COMPLETION RECORD |          |      |           |       |            |  |
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| O 35C2-2-63-1, par:   |                   |          |      |           |       |            |  |
| O. 35C2-2-63-1,       |                   |          | •    |           |       |            |  |
| O. 35C2-2-63-1, fig.  |                   |          |      |           |       |            |  |
| O. 35C2-2-63-1, fig.  |                   |          |      |           |       |            |  |
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| O. 21-SM80A-2-11,     |                   |          |      |           |       |            |  |
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| 4)                    |                   |          |      |           | •     |            |  |
| O. 21-SM80A-2-4, par. |                   |          |      |           |       |            |  |
| O 21-SM80A-2-4, par.  |                   |          |      |           |       |            |  |
| O 21-SM80A-2-4, par.  |                   |          |      |           | **    |            |  |
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| FIGURE A EQUIPMENT ITEM    | MAINTENAN                         | ICE OPERATION             | DEMONSTRATION EVI                                   |
|                            | Organizational-                   | VRSA Input                | UNSCHEDULED   |
|                            | Level Fault<br>Isolation          | Inner Security            | UNSCHEDULED   |
| ,                          |                                   | Outer Security            | UNSCHEDULED   |
| •                          | Organizational-<br>Level          | Receiver -<br>Transmitter | UNSCHEDULED   |
|                            | Adjustment                        | Converter -<br>Monitor    | UNSCHEDULED   |
|                            | Field-Level<br>Checkout           | Receiver -<br>Transmitter | Verification; T. O. 31X3-2-1<br>7-19 thru fig. 10-2 |
|                            |                                   | Converter - Monitor       | Verification; T. O. 31X3-2-1.<br>8-8 thru fig. 8-2  |
|                            |                                   | Power Supply .            | Verification; T. O. 31X3-2-1<br>9-6 thru fig. 9-4   |
|                            | Field-Level<br>Fault<br>Isolation | Receiver -<br>Transmitter | UNSCHEDULED   |
| ,                          |                                   | Converter - Monitor       | UNSCHEDULED   |
|                            |                                   | Power Supply              | UNSCHEDULED   |
|                            | Field-Level<br>Adjustment         | Receiver -<br>Transmitter | UNSCHEDULFD   |
|                            |                                   | Converter -<br>Monitor    | UNSCHEDULED   |
| 1337 Distribution Box (LF) | Organizational-                   | Level Checkout            | Verification; T. O. 215M80A<br>2-30 thru 2-32       |
|                            | Organizational-<br>Isolation      | Level Fault               | UNSCHEDULED   |
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| 7. O. 31X3-2-12-2, par<br>10-2   |           |          | `        |           |          |   |
| 7.O 31X3-2-12-2, par.            |           |          |          |           |          |   |
| O <sub>i</sub> 31X3-2-12-2, par. |           | 1        |          |           |          |   |
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| r.O. 21SM80A-2-11, par           |           |          |          |           | •        |   |
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| FIGURE A EQUIPMENT ITEM                | MAINTENANCE OPERATION                     | DEMONSTRATION BY                                  |
| 1338 Communication Control Console     | Organizational-Level Checkout             | UNSCHEDULIN                                       |
|  | Organizational-Level Fault<br>Isolation   | UNSCHEDULES                                       |
|  | Field-Level Checkout (Arm & Status Panel) | Verification; T.D. 31X3-3-4                       |
|  | Fiel Level Fault Isolation                | UNSCHEDULEE                                       |
| 1367 Motor-Generator (LCF)             | Organizational-Level Checkout             | Verification; T.O. 21-SM80 fig. 1-10A             |
| •                                      | Organizational-Level Fault<br>Isolation   | UNSCHEDULED                                       |
|  | Organizational-Level Servicing            | UNSCHEDULED                                       |
| 1412 Voice Reporting<br>Signal Assembl | Organizational-Level Checkout             | UNSCHEDULED                                       |
|  | Organizational-Level Fault<br>Isolation   | UNSCHEDULED                                       |
|  | Field-Level Checkout                      | Verification; T.O. 3151-2Gl                       |
|  | Field-Level Fault Isolation               | UNSCHEDULED                                       |
| ,                                      | Field-Level Component Replace-<br>ment    | UNSCHEDULED                                       |
|  | Inspection                                | UNSCHEDULED                                       |
| 3013 Console Test Set                  | Organisational-Level Utilisation (1243)   | Technical Approval Demont<br>1-20, Vandenberg AFB |
|  | Field-Level Checkout                      | Verification; T. D. 33D9-17                       |
| ,                                      | Field-Level Fault Isolation               | UNSCHEDULED                                       |
| ,                                      | Voltmeter Calibration                     | UNSCHEDULED                                       |
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| ∯<br>.*D. 21-SM80A-2-11, |           |          |         | 1-2-63    | EO+1367-1                                 | 4-2-42  |
|                          |           |          |         | 1-2-03    | 120-130 (+)                               | 4-6-03  |
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| O. 3151-2 <b>GSW 4-1</b> |           |          |         |           | •   |         |
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|                          |           |          |         | 1-4-63    | EO-1412-1                                 | 1+4-02  |
| <b>D</b>                 |           | ·        |         | 1-18-63   | EO-1412-2                                 | 4-22-60 |
|                          |           |          |         | ,         | ,   |         |
| reval Demonstration      |           |          |         | 1-29-63   | EO=3013-1                                 | 1=30-63 |
| D. 33D9-17-26-1          |           | ١        |         |           |   |         |
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|-----------------------------------|---------------------------------|--------------------------|--|------------|
| FIGURE A<br>No. EQUIPMENT ITEM    | MAINTENA                        | NCE OPERATION            | DEMONSTR                               | ATION EVE  |
| 3092 Programmer Group<br>Test Set | Organizationa<br>Level Utilizat |                          | Verification; T. O. 2-28 thru fig. 2-3 |            |
|                                   | (1201)                          | Complete                 | Technical Approva                      | l Demonst: |
|                                   | Field-Level C                   | heckout .                | Verification; % 0. 5-26                | 33D9-111   |
|                                   | Field-Level F                   | ault Isolation           | UNSCHEDULED                            |            |
|                                   | Field-Level<br>Adjustment       | Self Test<br>Generator   | Verification; T. Q. 8-6 thru fig. 8-3; | 33D9-111   |
|                                   |                                 | Clock                    | Verification; T. O. 8-6 thru fig. 8-3  | 33D9-111   |
|                                   |                                 | Evaluator A              | Verification; T. Q. 8-6 thru 8-13      | 33D9-111   |
|                                   |                                 | Evaluator B              | Verification; T. 0.<br>8-6 thru 8-14   | 33D9-111   |
| '                                 |                                 | Evaluator C Phase 1      | Verification; T. O.<br>8-6 thru 8-15   | 33D9-111-  |
|                                   |                                 | Evaluator C Phase 2      | Verification; T. Q. 8-6 thru 8-16      | 33D9-111   |
|                                   |                                 | Evaluator D              | Verification; T. C. 8-6 thru fig. 8-3  | 33D9-111   |
|                                   |                                 | Evaluator E              | Verification; T. C. 8-6 thru fig. 8-3  | 33D9-111-  |
| ·                                 |                                 | Reset and<br>Generator   | Verification; T. O. 8-6 thru 8-19      | 33D9-111   |
|                                   |                                 | Pulse Generator<br>Reset | Verification; T. Q. 8-6 thru fig. 8-3  | 33D9-111   |
|                                   |                                 | Latching Relay<br>Bias   | Verification; T. O.                    | 33D9-111   |
|                                   | Voltmeter Čal                   | abration                 | UNSCHEDULED                            |            |
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| r. O. 21-SM80A-2-3, par.<br>2-34        |           |       |         |            | ·         |         |
| roval Demonstration 1-18                | 11-7-62   |       |         |            | EO-3092-1 | 1-18-65 |
| <b>♦ Ø.</b> 33D9-111-3-1, <b>gar.</b> . |           |       |         |            | •         |         |
| D                                       |           |       |         |            |           |         |
| '. Q 33D9-111-3-1, par.<br>-3;          |           |       |         |            |           |         |
| '. Ø. 33D9-111-3-1, par.                |           |       |         |            |           |         |
| . <b>Ø</b> 33D9-111-3-1, par.           |           |       |         |            |           |         |
| 7. <b>Ø</b> . 33D9-111-3-1, par.        |           |       |         |            |           |         |
| '. Q. 33D9-111-3-1, par.                |           |       |         |            |           |         |
| . O. 33D9-111-3-1, par.                 |           |       | ,       |            |           |         |
| . Q. 33D9-111-3-1, par.                 |           |       | •       |            |           |         |
| .O. 33D9-111-3-1, par.                  |           |       | ,       |            |           |         |
| .O. 33D9-111-3-1, par.                  |           |       |         |            |           |         |
| .O. 33D9-111-3-1, par.                  |           | •     |         |            |           |         |
| .O. 33D9-111/3-1, par.                  |           |       |         |            | í         | ٠,      |
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| FIGURE A EQUIPMENT ITEM | MAINTENAN                            | NCE OPERATION      | DEMONSTRATION EN                                   |
|-------------------------|--------------------------------------|--------------------|--|
| 3109 Alarm Set Test Set | Organizational-<br>Level Utilization |                    | Attempted Verification; T. ( -2-4                  |
|                         | (1296)                               | VRSA Input         | Verification; T.O. 21-SM80<br>2-4A-thru fig. 1-9   |
|                         |                                      | Inner Security     | Verification; T.O. 21-SM80<br>2-4A thru fig. 1-9   |
|                         | ,                                    | Outer Security     | Verification; T. Q. 21-SM8 par. 2-4A thru fig. 1-9 |
|                         | Field-Level Ut                       | ilization (1296)   | Verification; T. O. 31X3-2-7-18 thru fig. 10-2     |
|                         | Field-Level<br>Checkout              | Fault Locator      | Verification; T.O. 33D9-13<br>5-9A thru fig. 5-8A  |
|                         | ·                                    | Antenna Simulator  | Verification; T. O. 33D9-13<br>5-16 thru 5-22      |
|                         | Field-Level<br>Adjustment            | Fault Locator      | Verification; T. O. 33D9-13 fig. 8-1               |
|                         | •                                    | Antenna Test Set   | Verification; T. O. 33D9-13-8-3                    |
|                         | Inspection                           |                    | UNSCHEDULED  |
| 4012 DAC Test Set       | Organizational<br>(1228, 1251)       | -Level Utilization | Technical Approval Demons<br>1-20, Malmstrom AFB   |
|                         | Field-Level<br>Checkout              | Continuity         | Verification; T. O. 33D9-13.<br>4-10 thru 4-12     |
| ,                       |                                      | Self-Verification  | Verification; T.O. 33D9-13' 4-1A, 4-2A             |
|                         |                                      | Meter Relay        | Verification; T. O. 33D9-1317-1, 7-2               |
|                         | •                                    | Oscillator         | Verification; T. O. 33D9-13. 7-1, 7-2              |
|                         |                                      | Test Signal        | Verification; T. O., 33D9-1317-1, 7-2              |
| ·                       |                                      |                    |  |

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| fication; T.O. 21-SM80A      | 10-15-62  | EO-3109-1 | 10-15-62  |           |           |            |
| . O. 21-SM80A-2-4, par.      | •         |           |           |           | -         |            |
| . O. 21-SM80A-2-4, par.      |           |           |           |           | • ,       |            |
| Q. 21-SM80A-2-4,             |           |           |           |           |           | *          |
| O. 31X3-2-12-2, par, 0-2     |           |           |           |           | ·         | <i>*</i> : |
| O, 33D9-137-2-1, par<br>5-8A |           |           |           |           |           |            |
| O. 33D9-137-2-1, par.        | )         |           |           |           | `         |            |
| O. 33D9-137-2-1,             |           |           |           |           |           | •          |
| O. 33D9-137-2-1, fig.        |           |           |           |           |           |            |
| •                            |           |           |           | 1-17-63   | EO-3109-2 | 1-17-63    |
| >va: Demonstration<br>m AFB  | 11-7-62   | EO-4012-1 | 11-29-62  |           |           | •          |
| O. 33D9-133-3-1, par.        |           |           |           |           | ·         |            |
| O. 33D9-133-3-1, fig.        |           |           |           |           |           |            |
| O. 33D9-133-3-1, fig.        |           |           |           |           |           |            |
| O. 33D9-133-3-1, fig         |           |           |           |           |           | ,          |
| O.: 33D9-133-3-1, fig.       |           |           |           |           |           |            |
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| FIGURE A EQUIPMENT ITEM  Field-Level Fault isolation  Field-Level Utilization (1201)  (1201)  (1201)  (1201)  (1201)  (1201)  Field-Level  (1201)  (12 |        |
|--|--------|
| ### Test Adapter Group    Field-Level Utilization (1201)   Technical Approval Decision   Technic | N EVI  |
| (1228, 1251)  (1201) Verification; T. O. 312  (1201) Verification; T. O. 313  (3092) Verification; T. O. 3315  5-26  (4252) Verification; T. O. 3315  Selt Test Checkout  Module A4  Verification; T. O. 3315  5-7 thru fig. 5-4  Module A4  Verification; T. O. 3315  5-7 thru fig. 5-4   |        |
| (1228, 1251)  (1201) Verification; T. O. 312  (1201) Verification; T. O. 313  (3092) Verification; T. O. 3315  5-26  (4252) Verification; T. O. 3315  Selt Test Checkout  Module A4  Verification; T. O. 3315  5-7 thru fig. 5-4  Module A4  Verification; T. O. 3315  5-7 thru fig. 5-4   | •      |
| (1201) Verification; T. O. 312  (3092) Verification; T. O. 331  (4252) Field-Level Self Test Checkout  Module A4  Verification; T. O. 33D  5-7 thru fig. 5-4  Verification; T. O. 33D  5-7 thru fig. 5-4   | monst  |
| (3092)  (4252) Field-Level Self Test Checkout  Module A4  Werification; T. O. 331 Verification; T. O. 332 Verification; T. O. 332 Verification; T. O. 332 Verification; T. O. 332 5-7 thru fig. 5-4  | (2-32- |
| (4252) Field-Level Self Test Verification; T. O. 33D Checkout  Module A4  Verification; T. O. 33D 5-7 thru fig. 5-4  Verification; T. O. 33D 5-7 thru fig. 5-4   | (3-12- |
| Field-Level Self Test Verification; T.O. 312 Checkout Self Test Verification; T.O. 33D  Module A4 Verification; T.O. 33D  5-7 thru fig. 5-4  | 9-111  |
| 5-7 thru fig. 5-4  |        |
| Mariliant T. O. 345  | 7-50-  |
| Medule A5 Verification; T. O. 331<br>5-7 thru fig. 5-4   | )7-50- |
| Module A5 Verification; T.O. 331 (Model A) 5-7 thru fig. 5-4   | 7-50-  |
| Generator A6 Verification; T.O. 331<br>5-7 thru fig. 5-4   | 7-50-  |
| Converter A7 Verification; T.O. 331 5-7 thru fig. 5-4  | 7-50   |
| Simulator A8 Verification; T.O. 331<br>5-7 thru fig. 5-4   | 7-50   |
| Field-Level MX-3618 Adjustment   |        |
| Stimuli Eval. UNSCHEDULED Ckt.   |        |
| Voltage Reg. UNSCHEDULED Ckt.  |        |
| Buffer Amp. Ckt.   |        |

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| val Demonstration<br>n AFB | ·         |          |          | :           |         | •        |  |
| ). 31X2-32-3-2             |           |          |          |             | ,       |          |  |
| D, 31X3-12-8-2             |           |          |          |             |         |          |  |
| D, 33D9-111-3-1, par.      |           |          |          |             |         |          |  |
| 33D7-50-3-1, par. 5-       | 9         |          |          |             |         |          |  |
| D. >3D7-50-3-1, par.       |           |          |          |             |         |          |  |
| 0, 33D7-50-3-1, par.       |           |          |          |             |         |          |  |
| D, ∃3D7-50-3-1, par.       |           |          |          |             |         |          |  |
| 0, 33D7-50-3-1, par.       |           |          |          |             |         |          |  |
| 04 >3D7-50-3-1, par.       |           |          |          |             |         |          |  |
| 0, 33107-50-3-1, par.      |           | ·        |          |             |         | •        |  |
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|                            |           |          |          | •           | PAGE    | 37       |  |

| FIGURE A EQUIPMENT ITEM | MAINTENANCE | OPERATION                                 | DEMONSTRATION EVENT |
|-------------------------|-------------|---|---------------------|
|                         |             | Eval, & Univib.<br>Ckt.                   | UNSCHEDULFD         |
|                         |             | False Eval. Ckt                           | CLUCHE, OTE         |
|                         |             | Self Test Ckt.                            | (1 CHF) ULEO        |
|                         |             | Response Time Eval.                       | ULSCHE (LE)         |
|                         |             | Ref. Voltage                              | UNSCHEDULED         |
|                         | M           | X-4214                                    | '                   |
|                         |             | Self Test Ckt                             | UNSCHEDULED         |
|                         |             | Stimuli Gen.<br>(25-33140)                | UNSCHEDULED         |
|                         |             | Stimuli Gen.<br>(25-33141)                | UNSCHEDULED         |
|                         | PI          | P-3 <b>37</b> 7                           |                     |
|                         |             | Univibrator<br>Čkt.                       | UNSCHEDULED .       |
|                         |             | Clock Pulse<br>Simulator-<br>(25-33111) + | UNSCHEDULED ;       |
|                         |             | Clock Pulse<br>Simulator<br>(25-33115)    | UNSCHEDULED         |
|                         |             | Clock Pulse Supply (25-33112)             | UNSCHEDULED         |
|                         |             | Clock Pulse Supply (25-33113)             | UNSCHEDULED         |
| ·                       |             |   |                     |

|                  |           | COMPLETION |      |           | )N RECORD |            |  |
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|                  |           |            |      |           |           | D2-14034-2 |  |

| FIGURE A EQUIPMENT ITEM                           | MAINTENANCE OPERATION -                             | DEMONSTRATION EV   |
|---|---|--|
|   | Power Supply (25-33122)                             | UNSCHEDULED  |
|   | Power Supply (25-33125)                             | UNSCHEDULED  |
|   | Power Supply (25-33126)                             | UNSCHEDULED '  |
|   | PP-3378   | and the same of th |
|   | Power Supply (25-33132)                             | UNSCHEDULED  |
|   | Pover Supply (25-33135)                             | UNSCHEDULED  |
|   | Power Supply (25-33136)                             | UNSCHEDULED  |
|   | PP-3376   |  |
| •   | Power Supply (25-33106)                             | UNSCHEDULED  |
|   | Power Supply (25-33123)                             | UNSCHEDULED  |
| 4043 Elevator Work Cage                           | Organizational-Level Utilization                    | UNSCHE DULED   |
| ·   | Field-Level Checkout                                | Verification; T. Or 35A4-2-  |
| ,   | Field-Level Fault Isolation                         | UNSCHEDULED  |
|   | Field-Level Servicing                               | UNSCHEDULED-   |
| ,   | Field-Level Repair                                  | UNSCHEDULED  |
| 4152 Base Maintenance<br>Electronic Facility Test | Field-Level (1201 Drawer A6, Utilization Part No40) | Verification; T. O <sub>c.</sub> 31X3-12-<br>11-17 thru 11-23  |
| Equipment   | (1201 Drawer A6,<br>Part No50)                      | Verification; T.O. 31X3-12-<br>11-17 thru 11-23  |
|   | (1201 Draker A7)                                    | Verification; T. O. 31X3-12-<br>12-15 thru 12-19   |
|   |   |  |

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| INSTRATION EVENT                        | DATE      | REPO       |          | DATE      | REPO      |   |  |
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| ₹D                                      |           |            |          |           |           |   |  |
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| an                                      | 12-18-62  | EO-4043-1  | 12 19 62 |           |           |   |  |
| ED .                                    | 12-10-02  | r.O-404 FI | 12-18-02 |           |           |   |  |
| T. Oct 35A4-2-31-1                      |           |            |          |           |           |   |  |
| ₹D ··                                   |           |            |          |           |           |   |  |
| ED-                                     |           |            |          |           |           | . 25 42   |  |
| ΣD                                      |           |            |          | 1-25-63   | EO-4043-2 | 1-43-93   |  |
| 1.O <sub>13</sub> 31X3-12-8-2, par. +23 |           |            |          |           |           |   |  |
| Γ. O1X3-12-8-2, par. 23                 |           |            |          |           |           |   |  |
| Γ. O. 31X3-12-8-2, par                  |           |            |          |           |           |   |  |
|   |           | 2          |          | BOEL      | NO NO.    | DZ-14934-<br>E 39   |  |

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|                              |                                      | THE TOTAL MEGICINETY                                |  |  |
|------------------------------|--------------------------------------|---|--|--|
| FIGURE A<br>EQUIPMEN: T ITEM | MAINTENANCE OPERATION                | DEMONSTRATION EVEN                                  |  |  |
|                              | (1243 DC Power Filter)               | Verification ;T. O. 31 <b>X3-3-9-</b> ;<br>11-3     |  |  |
|                              | (1243 Telephone ;<br>Xnitr. Control) | Verification; T. O. 31X3-3 9-                       |  |  |
|                              | (1338 Arm &<br>Status Panel)         | Verstication; T.O. 31X3-3-9-                        |  |  |
|                              | (3013)                               | Verification; T.O. 33D9-17-2                        |  |  |
|                              | (3092 Self Test<br>Gen.)             | Verification; T. O. 33D9-111-<br>8-6 thru fig. 8-3  |  |  |
|                              | (3092 Clock)                         | Verification; T. O. 33D9-111-<br>8-6 thruing, 8-3   |  |  |
|                              | (3092 Evaluator A)                   | Verification; T. O. 33D9-111-<br>8-6 thru fig. 8-13 |  |  |
| ·                            | (3092 Evaluator B)                   | Verification; T. O. 33D9-111-<br>8-6 thru fig. 8-14 |  |  |
|                              | (3092 Evaluator<br>C∲1)              | Verification; T. O. 33D9-111-<br>8-6 thru fig. 8-15 |  |  |
|                              | (3092 Evaluator<br>C\$2)             | Verification; T. O. 33D9-111-<br>8-6 thru 8-16      |  |  |
|                              | (3092 Fvaluator D)                   | Verification; T. O. 33D9-111<br>8-6 thru fig. 8-3   |  |  |
|                              | (3092 Evaluator E)                   | Verification; T. O. 33D9-111<br>8-6 thru fig. 8-3   |  |  |
|                              | . (3092 Reset & Gen                  | Verification; T.O. 33D9-111<br>8-6 thru fig. 8-19   |  |  |
|                              | (3092 Pulse Gen.<br>Reset)           | Verification; T. O. 33D9-111<br>8-6 thru fig. 8-3   |  |  |
|                              | (3109 Antenna<br>Simulator)          | Verification; T. O. 33D9-137<br>5-16 thru 5-22      |  |  |
|                              | (Dummy Decoder Assembly)             |   |  |  |
|                              |                                      |   |  |  |

|  | COMPLETION RECORD |          |      |           |           |           |  |
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| ns <b>tra</b> tion event                   | DATE              |          | ORT  | DATE      | · REPORT  |           |  |
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| O. 31X3-3-9-2-1, par.                      |                   |          |      | i         |           |           |  |
|  |                   |          |      | <br>      |           |           |  |
| 7. O; 31X3-3 °-2-1, par.                   |                   |          |      |           |           | İ         |  |
|  |                   |          |      |           |           |           |  |
| O; 31X3-3-9-2-1, par.                      |                   |          |      |           |           |           |  |
| . O. 33D9-17-26-1                          |                   |          |      |           |           |           |  |
| C.O. 33D9-111-3-1, par.                    |                   |          |      | 1         |           |           |  |
| 8-3  |                   |          |      |           |           |           |  |
| C.O. 33D9-111-3-1, par.                    |                   |          |      |           |           |           |  |
| r. Oj 33D9-111-3-1, par.                   |                   | ,        |      |           | _         |           |  |
| 1-13'                                      |                   |          |      | }<br>}    |           |           |  |
| .O. 33D9-111-3-1, par.                     |                   |          |      |           |           |           |  |
| (-14)                                      |                   |          |      |           |           |           |  |
| 7, O, 33D9-111-3-1, par.<br>15             |                   |          |      | 1         |           |           |  |
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| 7.O <sub>x</sub> 33D9-111-3-1, par.<br>3-3 |                   |          |      |           |           |           |  |
| C.O. 3D9-111-3-1, par.                     |                   |          |      | 1         |           |           |  |
| -3 ·                                       |                   |          |      |           |           |           |  |
| T.O. 33D9 111-3-1, par.<br>3- <b>19</b>    |                   |          |      |           |           |           |  |
| - 1 <del>V</del>                           |                   |          |      |           |           |           |  |
| ° O, 33D9-111-3-1, par.                    |                   | ,        |      |           |           |           |  |
| . O. 33D9-137-2-1, par.                    |                   |          |      |           |           |           |  |
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|                         |                         |                              |  | OTREMENT          |
|-------------------------|-------------------------|------------------------------|--|-------------------|
| FIGURE A EQUIPMENT ITEM | MAINTENIA               | ANCE OPERATION               | DEMONST                                  | CATION EVEN       |
|                         |                         | (3109 Fault<br>Locator)      | Verification; T. O. 5-9A thru fig. 5-8   | 33D9-137-2        |
|                         |                         |                              | Verification; T. O. 8-1                  | 33D9-137-7        |
|                         |                         | (4252 Pur Supply<br>Control) | Verification; T. O.                      | 31X2-62-4         |
|                         |                         | (4252 Reg. Power<br>Supply)  | Verification; T. O                       | 31X2-62-4         |
|                         |                         | (4252 Verifier<br>Indicator) | Verification; T. O                       | 31X2-62-4         |
|                         |                         | (4252 CSD<br>Verifier Unit)  | Verification; T. O.                      | 31X2-62-4         |
|                         |                         | (4490 Simulator<br>Set)      | Verification; T.O. 5-10, fig. 5-1        | 33D9-14-2         |
|                         |                         | (1412)                       | Verification; T.O.                       | 3151-2G <b>SW</b> |
| •                       |                         | (4491)                       | Verification; D2-1                       | 0825-44           |
|                         |                         | (1284, 1289)                 | Verification, T.O.                       | 35C2-2-63         |
|                         |                         | (1296 Receiver - Xmtr.)      | Verification; T.O.<br>7-19 thru fig. 10  |                   |
|                         |                         | (1296 Converter - Monitor)   | Verification; T.O.<br>8-8 thru fig. 8 2  | 31 X 3 - 2 - 12   |
|                         |                         | (1296 Power<br>Supply)       | Verification; T. O.<br>9-6 thru fig. 9-4 | 31X3-2-12         |
|                         | Field-Level<br>Checkout | Maintenance<br>Table         | Verification; T. C.<br>4-8, fig. 4-5     | 33D9-6-21         |
|                         |                         | Elec. Dummy<br>Load          | Verification; 1.0,<br>4-10               | 33D9 6-21         |
|                         |                         | Test Set Power Supply        | Verification; T.O.<br>4-12, fig. 4-6     | 33D4-6-21         |
|                         |                         | ***                          |  |                   |

|   | COMPLETION RECORD . |     |          |                |                   |            |  |
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| STRATION EVENT                                    | DATE<br>COMPLETED   | NO. | DATE O   | DATE COMPLETED | REPOR             | DATE       |  |
| O <sub>i</sub> 33D9-137-2-1, par.<br>5- <b>8A</b> | ·                   |     |          |                |                   | ·          |  |
| O; 33D9-137-2-1, fig.                             |                     | •   |          |                |                   |            |  |
| O 31X2-62-4-1                                     |                     |     |          |                |                   |            |  |
| O <sub>4</sub> 31X2-62-4-1                        |                     |     |          |                |                   |            |  |
| O <sub>4</sub> 31X2-62-4-1.                       |                     |     |          |                |                   |            |  |
| O; 31X2-62-4-1                                    | ·                   |     |          |                |                   |            |  |
| O. 33D9-14-26-1, par.                             |                     |     |          |                |                   |            |  |
| . O; 31S1-2GSW4-1                                 |                     |     |          |                |                   |            |  |
| 2-10825-44  |                     |     |          |                |                   |            |  |
| , O <sub>1</sub> 35C2-2-63-1                      |                     |     |          | 1:             |                   |            |  |
| .O. 31X3 2-12-2, par. 10-2                        |                     |     |          |                |                   |            |  |
| O, 31X3-2-12-2, par. 2                            |                     |     |          |                |                   |            |  |
| O, 31X3-2-12-2, par. 4                            | •                   |     |          |                |                   | •          |  |
| O, 33D9-6-21-1, par.                              |                     |     |          |                |                   |            |  |
| O <sub>4</sub> 33D9 6-21-1, par.                  |                     |     |          |                |                   |            |  |
| (O. 33D4-6-21-1, par.                             |                     |     |          |                | ,                 |            |  |
|   |                     |     |          |                |                   |            |  |
|   |                     |     | 7        | BOSI           | <b>NG</b> . NO, I | DZ-14934-Z |  |
|   |                     |     | <b>-</b> |                | PAGE              | 41         |  |

|                                  |                           |                                    | TO INCHICUTE AND           |                             |
|----------------------------------|---------------------------|------------------------------------|----------------------------|-----------------------------|
| FIGURE A PQUIPMENT ITEM          | MAINTENANCE OPERATION     |                                    | DEMONSTI                   | LATION EV                   |
|                                  | Field-Level<br>Adjustment | Converter -<br>Monitor Test<br>Set | UNSCHEDULED                |                             |
|                                  | ,                         | Launch Simulator<br>Test Set       | UNSCHEDULED                |                             |
| 4252 Code Inserter -<br>Verifier | Organizational-           | -Level Utilization                 | Technical Approv           |                             |
|                                  | Field-Level<br>Checkout   | VUR & FSA                          | Verification, T. Q         | . 31 <b>X</b> 2-6 <b>2-</b> |
|                                  | Field-Level Fa            | End-to-End                         | UNSCHEDULED UNSCHEDULED    |                             |
| •                                | Field-Level Adjustment    | Power Supply Control               | Verification; T. O         | 31X2-62-                    |
|                                  |                           | Code Indicator                     | Verification; T. O         | 31 <b>X</b> 2-62-           |
| •                                |                           | Reg. Power<br>Supply               | Verification; T. O         | 31 <b>X</b> 2-62-           |
| •                                |                           | Verstigr Unit<br>Indicator         | Verification; T. O         | 31X2-62-                    |
|                                  |                           | CSD Verifier<br>Unit               | Verification; T. O         | 31 <b>X2-6</b> Z            |
|                                  |                           | Coder Unit<br>Brushes              | UNSCHEDULED                | •                           |
| <i>,</i>                         | Inspection                | t<br>/                             | UNSCHEDULED                |                             |
| 4487 Command Signals Simulator   | Organizational-<br>Level  | - Partial                          | Verification; T. Q<br>2-73 | , 21-S <b>M8</b> 0.         |
|                                  | Utilization               | Complete                           | UNSCHEDULED                | ٠                           |

| :<br>•                     |           |           | COMPLET  | ION RECORD |         |             |
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| val Demonstration          | ,         |           |          |            |         |             |
| AFB                        |           |           |          |            |         |             |
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| Q. 31X2 62-4-1, par.       | 1         |           |          | •          |         |             |
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| O. 31X2-62-4-1             | 1 .       |           |          |            |         |             |
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| 0 31 <b>X</b> 2-62-4-1     |           |           |          |            |         |             |
| 3172-62-4-1                |           |           |          |            |         | 1           |
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| 0. 31X2-62 4-1             |           |           |          |            |         |             |
| QL 31X2-62-4-1             |           |           |          |            |         |             |
| J. 7172-02-4-1             |           |           |          |            |         |             |
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| d, 21-SM80A-2-3, par,<br>! |           |           |          |            |         |             |
| t<br>t                     |           |           | <b>L</b> |            |         | ,           |
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|                            |           |           |          |            | PAGE    | 42          |
|                            | •         |           | j        |            |         | <del></del> |

|  |   |                      | STRATION REQUIRE                        |
|--|---|----------------------|---|
| FIGURE A EQUIPMENT ITEM                    | MAINTENANCE                             | OPERATION            | DEMONSTATION                            |
|  |   |                      |   |
|  |   | 1                    |   |
| 4489 Message Generator                     | Organizational-<br>Level                | Partial .            | Verification; T.D. 21-<br>par. 2-73     |
|  | Utilization                             | Complete             | UNSCHEDULED                             |
|  | Field-Level Chec                        | :kout                | Verification; D2 10825                  |
|  | Field-Level Fault                       | t Isolation          | UNSCHEDULED                             |
| 4490 Missile Launch<br>Electrical Function | Organizational -<br>Level               | Partial              | Verification; T. D. 21-<br>par. 2-73    |
| Simulator Set                              | "tiliza ion                             | Complete             | UNSCHEDULED                             |
| -  | Field-Level<br>Checkout                 | Simulator Set        | Verification; T.D. 33: 5-10, fig. 5-1   |
|  |   | Recorier             | Verification; T. D. 33:<br>5-12         |
| •  | Fielo-Level Faul                        | t Isolation          | UNSCHEDULED                             |
| 4491 Launch Facilit.<br>Startup Unit       | Organizational-<br>Level<br>Utilization | Partial              | Verification; T.D. 21-2-73              |
|  |   | Complete             | Verification; T. D. 21, 2-67, fig. 2-37 |
|  | Field-Level Chec                        | ckout                | Verification; D2 [082]                  |
|  | Field-Level Faul                        | it Isolation         | UNSCHEDULED                             |
|  | Field-Level Adjustment                  | G/roStart Ass        | UNSCHEDULED                             |
|  | Alejasta                                | Power Supply<br>Assy | UNSCHEDULES                             |
|  |   | ,                    |   |
|  |   |                      |   |
|  |   |                      |   |
| •  |   |                      |   |
| •  |   |                      |   |

|             |                       | COMPLETION RECORD |          |                                       |           |           |      |  |
|-------------|-----------------------|-------------------|----------|---------------------------------------|-----------|-----------|------|--|
|             |                       |                   | PREVIOUS |                                       |           | CURRENT   |      |  |
| NST         | ATION EVENT           | DATE              | REPO     |                                       | DATE      |           | ORT  |  |
|             |                       | COMPLETED         | NO.      | DATE                                  | COMPLETED | NO.       | DATE |  |
| т.          | D. 21-SM80A-2-3,      | ·                 | ·        |                                       |           |           |      |  |
| LFD         |                       |                   |          |                                       |           |           |      |  |
| D2          | 10825-43              |                   | •        |                                       |           |           |      |  |
| LED         |                       |                   |          | i<br>i                                |           |           |      |  |
| τ.          | D. 21-SM80A-2-3,      |                   |          |                                       |           | ,         | •    |  |
| LFD         |                       |                   |          |                                       |           | • •       | ,    |  |
| т.<br>1     | D. 33D9-14-26-1, par. |                   |          | !                                     |           |           | ,    |  |
| Τ.          | D. 33D9-14-26-1, par. |                   |          |                                       |           | ,         | d.   |  |
| LFD         |                       | ·                 |          | •                                     |           |           | •    |  |
| : Т.        | D. 21-SM80A-2-3, par  |                   | •        | ,                                     |           |           | ,    |  |
| ; T.<br>-37 | D. 21-SM80A-2-3, par  |                   |          | ·<br>·                                | 1-25-63   | To Be Wee | třen |  |
| ; Ď2        | 10825-44              |                   |          |                                       |           | •         |      |  |
| ED          |                       |                   |          | •                                     |           | , ,       |      |  |
| LFD         |                       | ·                 |          |                                       |           | ,         | ÷    |  |
| LED         |                       |                   | •        | ;                                     |           | 1         |      |  |
|             |                       |                   |          | . •                                   |           |           | 4    |  |
|             |                       |                   |          | ,                                     |           | *         | •    |  |
|             | •                     |                   |          | · · · · · · · · · · · · · · · · · · · |           | *         |      |  |
|             | ,                     |                   |          | _                                     |           |           |      |  |
|             |                       |                   |          |                                       |           |           | . 4  |  |
|             |                       |                   |          |                                       |           |           |      |  |

MGE 44

# 6.4 CURRENT EVALUATION/OBSERVATION (E/O) REPORTS

The following pages contain the seven E/O Reports completed during the period covered by this document. The reports are arranged in numerical order, by report number.

Each E/O Report consists of a M Checklist and a supplementary rating analysis. The checklist contains numerical ratings for all major Maintainability features observed and evaluated during the indicated demonstration event. The supplementary rating analysis accompanying the checklist both substantiates the numerical ratings and provides constructive recommendations. The recommendations propose specific improvements to be made in order to attair Good' Maintainability.

### MAINTAINABILITY - EVALUATION / OBSERVATION REPORT

| port No. EO-1201-1/3092-1               | DateJanuary 18, 1963 | Page 1          | of 9         |
|---|----------------------|-----------------|--------------|
| Prepared by John L. Wright 2-5:61       |                      | 50-66 phone     | JU 6-6263    |
| Figure A No. 1201/ Nomen Programme      | er Group/Programme   | r Group Test Se | et           |
| Dwg. No. 25-20036-87/25-26725-1         | Serial No]           | Not Recorded    |              |
| Observed Event Demo 1-18 Location       | Malmstrom AFB        | Date Nove       | mber 7, 1962 |
| Title or Description Fault Isolation of | Programmer Group     |                 |              |
| T.O. Procedures T.O. 21-SM80A-2-3:      | Par 2-52 through 2-6 | 0               |              |

|    | мап                     | NTAINABILIT | Y CH | ECKLIST                     |     |
|----|-------------------------|-------------|------|-----------------------------|-----|
| 1  | Fault Isolation         | 3           | 14   | Lines and Cables            | 2   |
| 2  | Standardization         | N/0         | 15   | Fastenors                   | 3   |
| 3  | Interchangeability      | N/0         | 16   | Covers, Cases, Shields      | 4   |
| 4  | Packaging, Hounting     | 4           | 17   | Disposable Modules          | N/C |
| 5  | Accessibility           | 3           | 18   | Test Equipment              | 1   |
| 6  | Work Space              | 4           | 19   | Servicing, Handling, Equip. | N/A |
| 7  | Testing, Servicing      | 3           | 20   | Tools                       | N/A |
| 8  | Displays                | 1           | 21   | Platforms, Stands, Shelters | N/A |
| 9  | Handles                 | 4           | 22   | Technical Order             | 3   |
| 10 | Labels, Marking         | 3           | 23   | Figure A                    | N/  |
| 11 | Controls                | 4           | 24   | Form B/C                    | N/  |
| 12 | Work Aids               | N/A         | 25   | Specifications              | N/  |
| 13 | Connectors, Connections |             | 26   | Personnel Requirements      | N/  |

#### CHECKLIST RATINGS

N/A Good Maintainability Not Applicable

Satisfactory Maintainability N/O No Observation Possible

Unsatisfactory Maintainability N/E Not Evaluated Poor Maintainability

Rating analyses are provided on succeeding pages, for all checklist items rated 3 or lower.

ATTACHMENT: "Minutes of Post-Demonstration Critique of Class I Demonstration 1-18" D2-14934-2 Page 45 8 November, 1962

#### Item 1. Fault Isolation

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General Fault Isolation capability is apparently quite good, except during final end-to-end checkout. If a malfunction indication occurs during end-to-end checkout (paragraph 2-60 of T.O. 21-SM80A-2-3), repetition of the entire programmer group checkout procedure is required. It would be much less time-consuming if the end-to-end checkout procedure contained instructions directing the technician to repeat only specific drawer checks for any given malfunction indication. (NOTE: This problem so impressed the Air Force Technical Approval Team that it was made a matter of record. Refer to paragraph 3 of the attached Post-Demonstration Critique Minutes.)

#### RECOMMENDATION:

The Programmer Group end-to-end checkout procedure should be revised to include instructions directing the technician to repeat only specific drawer checks for any given malfunction indication.

## Item 5. Accessibility

Programmer Group connectors, to which test set cables must be connected, are located at the top rear of the rack. They are therefore not readily accessible without a stepladder. Moving the stepladder in and out of position is time-consuming and clumsy, and might conceivably lead to damage of the test set. The ladder cannot be left in position, because it obscures the equipment and is simply in the way.

### RECOMMENDATION:

One possible way of eliminating the ladder problem would be redesign of Figure A 1201 to provide completely accessible test connectors, possibly also eliminating the necessity for breaking some of the connections at the top rear of the rack.

## Item 7. Testing and Servicing

One of the paramount Maintainability criteria specified for Minuteman in STL Document 6120-6882-DU-RDI (and restated in M Memo 62-1) requires that test points for fault isolation at the operational site be brought to standard connectors on drawer fronts. The implication is that test connections are to be readily accessible. Programmer Group drawers have indeed been provided with individual test connectors, but many additional connections are required at the top rear of the rack during checkout. The poor accessibility of these connections is discussed under Item 5.

#### RECOMMENDATION:

The test connectors recommended under Item 5 should be located on the face

## Item 1. Fault Isolation

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### **RECOMMENDATION:**

One possible way of eliminating the ladder problem would be redesign of Figure A 1201 to provide completely accessible test connectors, possibly also eliminating the necessity for breaking some of the connections at the top rear of the rack.

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# RECOMMENDATION:

The test connectors recommended under Item 5 should be located on the face

## RECOMMENDATION: (Continued)

of a new drawer A5, which would replace the present blank panel between drawers A4 and A6.

## Item 10. Labels and Marking

a. In preparation for the demonstration, a Boeing technician inserted a faulty circuit board in one of the Programmer Group drawers. He had to try several times before he was able to insert it so that it would mate properly with its connector. The difficulty was caused by the fact that it is very hard to select simultaneously the proper slots into which both ends of the card should slide. It is quite easy to start the card in non-opposing slots, resulting in crooked card installation and possibly causing connector or card damage.

### RECOMMENDATION:

All slots in which cards are installed should be plainly marked to differentiate them from unused slots. Opposing slots should both be marked, to preclude misalignment of boards during insertion.

b. Plastic program cards are used to operate the 3092 test set. Though the T.O. contains instructions specifying proper insertion of the cards in the card reader, it would be quite possible for a technician to insert them wrong-end-first.

### RECOMMENDATION:

Test set program cards should have a positive printed indication of the proper end to be inserted into the card reader.

## Item 13. Connectors and Connections

a. Because of the fact that the 3092 Test Set was apparently designed to connect to several already - existing operational connectors of Fig. A 1201, there are 19 cable connections to be made before any checkout can be accomplished. Naturally, this is very time-consuming, especially since the techn ician must make over half of them in an area of limited accessibility, while standing on a stepladder. (NOTE: This problem, too, was made a matter of record by the Air Force Technical Approval Team. Refer to paragraph 4 of the attached Post-Demonstration Critique Minutes, which is a dignified summary of the much more vehement off-the-record comments made by several of the critique attendees).

## RECOMMENDATION:

The multitude of connections required could be greatly reduced through incorporation of the test connectors recommended under items 5 and 7. Large

## RECOMMENDATION: (Continued)

multi-pin test connectors should be used, combining many circuits which under present conditions can be completed only by separate connections to many existing operational connectors.

b. It undoubtedly will remain necessary to disconnect at least some of the connections at the top rear of the Programmer Group, to isolate the equipment from external circuits during checkout. But it may be possible that some of the operational connections could remain intact without affecting the checkout operation.

### RECOMMENDATION:

Only those operational programmer group connections which would affect the checkout operation should be disconnected. As many connections as possible should remain undisturbed.

## Item 14. Lines and Cables

The programmer group checkout procedure requires self-test of the 3092 Test Set before actual checkout of the programmer group. Special self-test connections of the 19 test set cables are required; this occupies over half of the time required for self-test performance. Of the 19 cables, 16 are then disconnected (from the special self-test distribution box) and reconnected elsewhere. By the time this is accomplished, the area around the programmer group resembles the aftermath of an explosion in a spaghetti factory, no how methodically the reconnections were done. The programmer group is draped with cables of many different sizes; the smallest cables incongruously are terminated in the largest connectors, to mate with the operational programmer group connectors. Through it is not noted specifically in the attached Minutes, the Technical Approval Team Chairman stated during the critique that there "must be over 1000 dollars tied up just in cables and connectors for the 3109 Test Set."

# RECOMMENDATION:

Incorporation of the programmer group test connectors recommended under Items 5, 7, and 13a, coupled with redesign of the 3092 Test Set as recommended under Item 18, would greatly reduce the confusion and loss of time which are inherent in checkout of the programmer group under present conditions.

# Item 15. Fasteners

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A Boeing technician removed the cover of a programmer group drawer to insert a faulty circuit board. The cover was held by 26 non-captive screws.

## RECOMMENDATION:

Fewer screws should be used to hold programmer group drawer covers. Captive screws would be much more desirable than non-captive screws, to facilitate handling.

## Item 18. Test Equipment

a. As mentioned under Item 14, special self-test connections of the 19 test set cables, 16 of them to a separate "suitcase" distribution box which is considered part of the test set, are required. The distribution box serves no other purpose than to interconnect the cables during the self-test procedure. The time presently required just for making all the self-test connections is over half an hour. (The whole self-test, including hookup, takes less than an hour.)

Incorporation of the programmer group test connectors recommended under Items 5, 7, 13a, and 14 would require redesign of the 3092 Test Set Fault Locator, to provide compatible test cabling. The redesigned fault locator would have a significantly reduced number of test cable connectors. In fact the reduction would be so significant that it should be possible to incorporate the self-test interconnection function now performed by the distribution box into the fault locator itself. The self-test interconnection connectors could be placed on the fault locator in the space to be vacated through reduction of the present number of test connectors. The test set would then comprise only two "suitcases" instead of three, since the distribution box would be eliminated.

Reduction in the number of test cables would alleviate the problems which are naturally inherent in storage and handling of so many cables for one purpose. It would also achieve a time saving of well over 10 per cent in the total programmer group checkout operation.

### RECOMMENDATION:

The advantages to be realized through redesign of the 3092 test set (and the 1201 programmer group, of course) are great enough that such redesign is strongly recommended.

b. An even more significant time saving could be realized if the Test Set redesign were to include incorporation of a semi-automatic program card reader. Perhaps as many as 200 cards must be used during the entire checkout operation. Manual insertion of that many cards, one by one, is naturally very time-consuming and tedious.

### RECOMMENDATION:

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Redesign effort should include at least consideration of the possibility that a suitable semi-automatic card reader might be incorporated in the test set.

#### NOTE

Recommendations under a and b, above might not necessarily be valid if the present Programmer Group maintenance philosophy were abandoned. If a philosophy of wholesale drawer replacement without on-site checkout were adopted, actual usage of the 309° Test Set might not be frequent enough to allow a significant overall time saving through incorporation of the recommended improvements.

c. "The card reader handle must not be left in the up position for more than three minutes during the following tests. Launch Enable Switch may burn up if card reader is engaged more than 3 minutes. This caution does not apply to card number -216."

This caution note is inserted after paragraph 2-60 step a. of T.O. 2ISM80A-2-3. It is hardly adequate as the sole protection against burning up the Launch Enable Switch. The technician certainly cannot be expected to start a stop-watch each time he lifts the handle, because he isn't told to do so. And, since he is primarily concerned with performing the step-by-step checkout procedure, it will be very easy for him to forget the caution note before he gets very far into that procedure.

## RECOMMENDATION:

Automatic protection of the Launch Enable Switch should be built into the 3090 Test Set. A timer should start each time the handle is lifted, and automatically either sound a warning or disconnect the circuit after three minutes.

d. Part numbering of program cards is very confusing. Card decks and individual cards are identified by dash numbers of the same drawings. As a typical (but hypothetical) example of the confusion that can result, assume that deck no. 25-26646-1 contains cards no. 25-26646-137 through no. 25-26646-164. If the technician is informed that the -1 deck contains cards -137 through -164 he can grasp and remember this fairly well. He will even be able to sort the cards properly if the -1 deck inadvertently gets mixed with a -13 deck consisting of cards -108 through -135. But what happens to the cards when there is a minor equipment change?

Suppose that equipment rework necessitates changes in cards -138, -147, -149, -151, -152, and -161. These dash-numbers must be dropped and six new cards, -165 through -170, must be added. Of course this changes the deck dash-number to -2. And what cards does it contain? The ease of remembering is suddenly gone, because the deck is no longer an easily remembered unbroken sequence of card dash-numbers. Now how can the technician at the Launch Facility sort mixed decks, or even be sure his unmixed deck is really complete? For that matter, since individual cards are marked only with the card dash-number and nowhere indicate the deck dash-number or equipment part numbers to which they apply, how can he even be sure that deck is actually the proper one for the equipment he is checking?

D2-14984-2

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### NOTE

The above example is really more factual than hypothetical. It is based upon the situation which actually exists for the card deck specified in paragraph 2-59 steps a through i of T.O. 21-SM80A-2-3. The only thing hypothetical is the initial deck configuration.

## RECOMMENDATION:

The best way to minimize confusion among the maintenance personnel would be to adopt a card deck numbering system in which each deck is composed of serially-numbered cards (beginning in each case with 1, 2, 3, etc.), all bearing the deck part number. Equipment changes should be accommodated by decks with new dash-numbers to the basic deck part number, but each new deck should again have cards numbered 1 and on. Then if the technician's deck is incomplete or contains cards belonging in another deck he will know it immediately.

## Item 22. Technical Order 21-SM80A-2-3 (changed 6 January 1963)

a. Paragraphs 2-56 through 2-60 are inconsistent in their methods of identifying test set program card decks. The identification used is:

Paragraph 2-56 step a - "15-30947-125 through 25-30947-147"

Paragraph 2-58 step a - "25-31059-106 through 25-31059-110"

Figure 2-34 - "Deck Number"
"25-26643-140"
"25-26644-1"
"25-26644-165"
"15-26645-1"

Paragraph 2-59 step a - "deck no. 25-26646"

Paragraph 2-60 step a - "15-26643-165 through 25-26642-232"

Note that in some cases reference is made to a series of cards, and in others a deck number is specified. No information is given to indicate how many or what cards constitute a given deck (until farther along in subsequent steps; and then the technician is simply told, for example, to use "card numbers -139 through -171 except for numbers -147, -149, -151, -152, and -161," without any indication of the deck number). No information is given to indicate that a given series of cards may intentionally have missing cards (until, again, farther along in subsequent steps). The inconsistency and incompleteness of information

are very apt to confuse the technicians, and in fact did confuse the Boeing technicians who conducted the demonstration covered by this report.

### RECOMMENDATION:

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Each card deck and its contents should be completely identified in the first time it is specified. Example: "Remove program deck 25-26646-2 (cards 25-26646-137 through -171, except for missing cards -138, -147, -149, -151, -152, and -161) from card container for..." (All of the statements tabulated above should be revised.)

b. Paragraph 2-56 step a initiates use of program cards "25-30947-125 through 25-30947-147." Then, during use of these cards, paragraph 2-56 steps v-1 and ax-1 require use of cards -148 and -149, respectively. From the associated text it is obvious that steps v-1 and ax-1 were inserted as alternates for paragraphs steps v and ax, to be used when a 25-26725-2 test set is used in place of the original 25-26725-1 test set. Apparently paragraph 2-56 step a was overlooked when the change was inserted.

## RECOMMENDATION:

Paragraph 2-56 step a should be changed to include the -148 and -149 cards. To accomplish both this and the recommendation made under a above, the following revised wording is suggested to replace paragraph 2-56 step a:

#### "NOTE

- "Omit step a when using test set 25-26725-2. Omit step a-1 when using test set 25-26725-1.
- "a. Remove program card deck 25-30947-2 (cards 25-30947-125 through -147) from card container. Insert deck in UNTESTED CARDS slot of Fault Locator (figure 2-26).
- "a-1. Remove program card deck 25-30947-3 (cards 25-30947-125 through -149, except for missing cards -128 and -139) from card container. Insert deck in UNTESTED CARDS slot of Fault Locator (figure 2-26)."
- c. Paragraph 2-56 step b specifies that, among other required indications, a red light "should start to flash at 4 cps." The immediate reaction of a technician reading the requirement is to attempt a count, to verify that the rate is indeed 4 cps, as specified. Naturally, it is impossible to count that fast, and twice as impossible to count the 8 cps specified in the note of step 2-56 ap (3).

### RECOMMENDATION:

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Visual verification of 4 cps and 8 cps flash rates is impossible. The 4 cps and 8 cps rates should therefore be replaced by general descriptive terms (such as "rapidly" and "very rapidly", respectively). Steps requiring such generalization are 2-56 b, 2-56 ay (3) NOTE, 2-56 ay (5), and 2-57b.

d. Identical notes inserted before steps 2-56 d, 2-58 c, 2-59 f, and 2-60 c specify the proper orientation of program cards for insertion in the card reader. The note states that "cards must be inserted with printed side up and the cut end toward the operator inserting the card." Since the operator is free to move anywhere he pleases around the fault locator "suitcase," this is not a very precise instruction.

### RECOMMENDATION:

Program card insertion instructions given in the notes preceding steps 2-56 d, 2-58 c, 2-59 f, and 2-60 c should be changed to use a fixed object, rather than the operator, as the point of reference. For example, it would be much more clear to state "Cards must be inserted with printed side up, and cut end away from the card reader," or "cards must be inserted uncut-end-first, with printed side up."

e. Paragraph 2-59 tells the technician to look up a card deck number in figure 2-34, and then to "Use this deck after performing steps a through j." Steps a through j then use an entirely different deck. Reference to figure 2-34 in paragraph 1-59 is premature, and only causes confusion in the technicians' minds.

### RECOMMENDATION:

The second and third sentences of paragraph 2-59, referring to figure 2-34, should be deleted. Step 2-59 k should then be revised to direct the technician to figure 2-34, for selection of the proper card deck to be used in steps 1 and on.

f. Steps 2-59 i and 2-60 e do not disclose whether the cards specified following the words "except for" are intentionally missing or are present but will not be used. This might be confusing to the technician.

### RECOMMENDATION:

Steps 2-59 i and 2-60 e should be revised to indicate specifically that certain cards are missing. This can be accomplished easily by revising the wording to read "... except for missing cards..." etc.

HEADQUARTERS
SITE ACTIVATION TASK FORCE
BALLISTIC SYSTEMS DIVISION (AFSC)
Malmstrom AFB, Montana

TO: Members

DATE: 8 November 1962

SUBJECT: Minutes of Post-Demonstration Critique of Class I Demonstration 1-18

FROM: Lt Col Hahnemann

- 1. The demonstration was conducted at Site B-5 on 7 November in accordance with T.O. 21SM80A-2-3, 15 September 1962 and 21SM80A-2-3C, 27 September 1962. The TAT agreed that the demonstration was conducted in a satisfactory manner and authorized the Chairman to so notify The Boeing Company.
- 2. The TAT made the following recommendations for Demonstration 1-18:
- a. BSD Exhibit 61-32 presently states operating crews are to have no knowledge of location of fault. This is unimportant. Since the demonstration is proving the adequacy of the T.O. and equipment, proper operation of equipment locating the fault satisfies the purpose of the demonstration.
- b. It is recommended that VRSA be in an operating condition prior to beginning the three related demonstrations, 1-18, 1-19, 1-20.
- c. The MAIR should reflect the VRSA be queried just prior to the fault, during the fault and after the fault removed.
- 3. There definitely is lack of correlation of T.O. and M&IR and card in regard to identification of cards where the fault may be. Major Fulton of TAT will contact Mr. Volke of The Boeing Company Engineering to inform him of the problem and make the recommendation for what action should be taken to resolve these problem areas.
- 4. The procedure for self-test of test equipment is over-complicated and time-consuming because of the necessity for connecting and removing a total of 19 cables.
- 5. The Boeing Company crew which performed the demonstration is to be commended for the manner in which the demonstration was conducted. This demonstration crew was under the direction of Michael Halsey, TBC.
- 6. AFTO 22's generated against this demonstration will be attached to these minutes.

### 7. Attendecs:

Mr. W. P. Damey TEC Mr. F. E. Whittemore Mr. Q. Y. Halsey TBC QC TEC Mr. S. G. Wicnewski Mr. John L. Wright SATAF/STL Mr. G. S. Allen Mr. John A. Labria Major W. L. Fulton SATAF Engr Captain Ellis Curtis SATAF Engr SAC (341st) Lt Col Elton Lt Col k. H. Hahnemann, Chairman SATAF Engr

ROBERT H. HAHNEMANN, Lt Col, Chairman

FRANCIS M. SHIME, Captain, OOAMA

RALPH D. CLAXTON, AFQC

## MAINTAINABILITY WWW.WOOM/COCKRYATION REPORT

| port No. 10-1243-1/3013-1 D                | 00001_30_63P0601004        |
|--|----------------------------|
| Prejared by A. H. Smith                    | )(/8_6207-) phone_866-7761 |
| Figure A No.1243/3013 Momen_Launch Control |                            |
| Dug. No. 25-24172/25-25980-1               | Serial No. 000004/000003   |
| Observed Event Deno 1-18, 20 Location      | VAFB Date 1-29-63          |
| Title or Description TAT Class I Desc      | Console Checkout           |
| 7.0. Precedures 21-SM80A-2-3 Paras. 3-     | 21A and B. 2-4 thre 2-15   |

|     | : NAIM                  | Painabili! | Y CH | ECKLIST                     |      |
|-----|-------------------------|------------|------|-----------------------------|------|
| ٠,  | Fault Isolation         | 4          | 14   | Lines and Cables            | 4    |
| 2   | Standardisation         | 4          | 15   | Fasteners                   | 3    |
| - 3 | Interchangeability      | 4          | 16   | Covers, Cases, Shields      | 3    |
| 1   | Packaging, Nounting     | 3          | 17   | Disposable Hodules          | N/O  |
| 5   | Accessibility           | 3          | 28   | Test Equipment              | 4    |
| 6   | Work Space              | 3          | 19   | Servicing, Handling, Equip. | N/O  |
| 7   | Testing, Servicing      | 4          | 20   | Tools                       | 2    |
| •   | Displays                | 4          | 21   | Platforms, Stands, Shelters | N/A  |
| 7   | Handles                 | 4          | 22   | Technical Order             | 1    |
| 10  | Labels, Harking         | 4          | 23   | Figure A                    | I/E  |
| 11  | Controls                | 4          | 24   | Form B/C                    | N/E  |
| 12  | Work Aids               | 3          | 25   | Specifications              | 11/3 |
| 13  | Connectors, Connections | 3          | 26   | Personnel Requirements      | 4    |

# CHECKLIST RATINOS

Good Maintainability

Satisfactory Maintainability

Uncetisfactory Maintainebility
Poor Maintainebility

Not Applicable No Observation Possible

Not Evaluated

Anting analyses are provided on succeeding pages, for all shocklist items rated 3 or lower.

Item 4 a. The instrument penel of the Console Test Set AN/OSN-58 is accured to the bottom of the case by 22 serves, which appears to be an excessive number.

Recommendation: The number of serves should be reduced. Ton should be adequate.

being retained by a hinged cover. The hinged cover is lined with sponge rubber of approximately two inches thickness. The executive, and apparently unnecessary, thickness of the padding results in considerable difficulty in closing the cover, and makes careful arrangement of the cables necessary.

Recommendation: The thickness of the rubber padding should be reduced to half an inch.

During the Traffic-on-net and SCN-test-received checkout procedure, (paragraph 2-14 of T.O. 21-SMSOA-2-3) it is necessary to connect test cables to 300AlJ6 and J7. These jacks are located on the back of the Launch Control Console, and are difficult to reach. There are a number of other cables mounted on the back of the console, and these are even more difficult to reach due to the small clearance between the console and the wall of the capsule, and due to the fact that the connectors would be manipulated at the fullest extent of the arm.

Recommendation: All cables on the back of the Console should be relocated so as to be more readily accessible, or alternatively the console should be moved approximately three inches further away from the wall.

- Item 12 Connectors Pll of Display Panel Cable, and Pl3 of Status Monitor Cable, in the Console Test Set, are of the changeable keying variety. One has a male keying shell, the other a female. To change the keying, a knurled lock-nut must be loosened and screwed out approximately one eighth of an inch, then the shell must be moved out so as to disengage its retaining castellations. The shell may then be rotated to the desired position, pushed back to engage the castellations and secured by tightening the locking unit. Considerable difficulty was encountered during the demonstration for two reasons:
  - 1. The T.O. did not explain the action of these special connectors.
  - 2. The keying shells were stiff and were not easy to disengage from their castellations. Even after the mode of operation had been deduced it was still difficult to withdraw the female shell without ricking damage to the connector pins or to the fine-threaded lock-nut. This was finally accomplished by inserting the blade of a serewdriver in a greeve near the end of the shell and levering the shell out very earefully.

### Recommendation:

1. A tool should be provided with the Test-Set to facilitate withdrawal of the female keying shell. A simple spring-steel device which expands and gripe the groove in the shell would be quite adequate.

2. The T.O. should be revised to incorporate a fuller description of the key-changing process (see item 22).

V1 of the GSM-58 has to be connected to 300AlJ? at the rear of the esqsole, during the test procedures. The connector that is nermally connected to J? is an elbow connector, due to work-space considerations,
but P10 of W1, the test connector, is a straight plug, making connection
difficult unless the kick-panel at the rear of the console knee-hole is
removed.

Recommendation: P10 of W1 of the GSM-58 should be a 120 degree elbow connector.

The hinged cable-storage cover in the lid of the AN/GSM-58 is secured by two quarter-turn fasteners. Due to the large pressures exerted on these fasteners (see item 4) it is probable that they will be high failure rate items. If the female part of the fastener fails, it will be very difficult to replace due to the rivetted and welded construction of the lid.

#### Recommendation:

Item 20

- 1. The pressure should be reduced as indicated in item 4.
- 2. Larger, more robust fasteners should be used.
- 3. A third fastener should be added to distribute the load more evenly.
- Item 16 All the connectors in the AN/GSM-58 have loose plastic dust covers, including those on the instrument panel.

Recommendation: Captive dust covers should be used.

When removing the Launch Control Panel (Demonstration 1-18) per paragraph 3-21A, of 21-SM8OA-2-3, it is necessary to undo the allen screws holding the Mechanical Code Units on to the back of the panel. The purpose of this step is to dissipate the codes in the Code Units.

The allen screws utilized are of a non-standard size; and it was found that a suitable allen wrench was not included in the tool-kit available. Further inquiry revealed that wrenches used at the Code Inserter Verifier room had been purchased locally, and that the item is comparatively difficult to obtain. A special wrench used by Boeing technicians (ground to size from a larger wrench) was eventually obtained, but considerable time was wasted.

### Recommendation:

The need for using a bastard-size serve should be re-evaluated.
 If their usage is supposed to make access to the code units more difficult, it should be borne in mind that the screws are not countersunk and maybe removed by using long-need pliers.
 If security is not the reason, then the use of a standard size of screw should be strongly recommended.

2. If the existing screws must be used, then a special wreach should be supplied and listed in the T.O. as necessary special

equipment.

Item 22 a. Paragraph 2-10c of 21-SM80A-2-3 contains a note explaining how to change the keying of plugs P11 and P13 of the GSN-55. This note does not describe the process accurately enough, and it was necessary during the demonstration to disassemble the plugs before their mode of operation was discovered.

Recommendation: The Note should be expanded along the following lines: "Key plug Pl1 to plug Pl3 by unscrewing knurled sleeve nut on barrel of plug approximately one eighth of an inch, pulling keying shell outwards to disengage castellations, turning barrel to position 2 (as indicated through window on barrel), and tightening sleeve nut."

b. Paragraph 2-13c was found to be very confusing and easily misunderstood, especially steps (2) through (5). Considerable discussion resulted before the correct method and sequencing of the test was discovered.

Recommendation: The relevant portions should be re-written along the following lines.

#### 2-13e

- (2) Push LCC . . . . . etc. . . . . push button is released NOTE

  For the remaining positions of the STATUS DISPLAY SELECTOR switch, an audible alarm may be activated (busser or bell) and one of the two ALARM indicators on the Alarm-Control Panel may be illuminated. Refer to Fig. 2-5 to determine the proper reactions for each switch position.
- (3) Move STATUS DISPLAY SELECTOR switch to LAUNCHER A, FAULT-ALARM 1 position.
- (4) Push LCC DISPLAY TEST push button and hold im pressed position.
- (5) Push ALARM RESET switch on Alarm-Honitor Panel when alarm is activated; audible alarm should reset.
- (6) Release LCC DISPLAY TEST push button; visible Alarm should go out.
- (?) Repeat steps (3) through (6) for the other STATUS DISPLAY SELECTOR switch positions listed in Fig. 2-5

For those switch positions listed in Fig. 2-5 that do not result in activation of an alarm, it is only necessary to push the LCC DISPLAY TEST push button momentarily to confirm illumination of the appropriate MISSILE STATUS IMDIGATOR—LAUNCHER PANEL INDIGATOR LIGHT.

## MAINTAINABILITY #WALUATION /OBSERVATION REPORT

| Report No. E0-1367-1     | Date 1-2-63        | page       | 1of       | <u> </u> |
|--------------------------|--------------------|------------|-----------|----------|
| Prepared by A. H. Smith  | M/S 6207-1         | phone_     | 866/3761  |          |
| Figure A No. 1367 NOMEN  | Motor Generator (  | rcc)       |           |          |
| Dwg. No. 10-20945        |                    | Serial No. |           |          |
| Observed EventT.O. V&V   | Location           | VAFB       | Date1-2-6 | 3        |
| Title or Description Mot | or Génerator Check | out        |           |          |
| T.O. Procedures 21-SM8OA | -2-11, Figure 1-10 | A          |           |          |

|    |                         | MAINT | AINAE | ILITY CHECKLIST             |     |
|----|-------------------------|-------|-------|-----------------------------|-----|
| 1  | Fault Isolation         | 4     | 14    | Lines and Cables            | 4   |
| 2  | Standardization         | 4     | 15    | Fasteners                   | 4   |
| 3  | Interchangeability      | 4     | 16    | Covers, Cases, Shields      | 3   |
|    | Packaging, Mounting     | 2     | 17    | Disposable Modules          | N/A |
| 5  | Accessibility           | 2     | 18    | Test Equipment              | 3   |
| 6  | Work Space              | N/A   | 19    | Servicing, Handling, Equip. | N/O |
| 7  | Testing, Servicing      | N/O   | 20    | Tools                       | N/O |
| 8  | Displays                | N/A   | 21    | Platforms, Stands, Shelters | N/O |
| 9  | Handles                 | 4     | 22    | Technical Order             | N/E |
| 10 | Labels, Harking         | 3     | 23    | Figure A                    | N/E |
| 11 | Controls                | N/A   | 24    | Form B/C                    | N/E |
| 12 | Work Aids               | N/E   | 25    | Specifications              | N/E |
| 13 | Connectors, Connections | 2     | 26    | Personnel Requirements      | 4   |

## Checklist Ratings

4 Good Maintainability

3 Satisfactory Maintainability

M/A Not Applicable
M/O No Observation Possible

2 Unsatisfactory Maintainability

N/E Not Evaluated

1 Poor Maintainability

Rating analyses are provided on succeeding pages, for all sheeklist items rated 3 or lower. D2-14984-2

Item 4.

OF

The Control Panel box was not packaged for ease of maintenance-in-place. Due to the location of the generator in a pit, it is almost impossible to remove the access panel without removing the entire Motor Generator Set from the pit. The T.O. therefore calls for removal of the M.G. for most of the fault isolation steps.

During the V&V exercise observed, an over-voltage condition was discovered on step w of Figure 1-10A. The 60 cycle output was 125 volts, which is 2.6 volts high. At this point it would have been necessary to remove the M-G from the pit and replace the 60 cycle regulator if the T.O. fault isolation procedure was followed. The Test Operator decided to proceed with the V&V and appeal to Seattle engineering for a waiver on this point but due to A.F. personnel problems, the V&V was abandoned. It is obvious, however, that re-packaging of the Control Panel could eliminate the need for M-G set removal.

Two possible ways of accomplishing the re-packaging are:

- a. Re-design the Control Panel so that the 60 cycle regulator, 400 cycle regulator and Transfer Panel are plug-in units that are withdrawn vertically from the top surface of the Control Panel.
- b. Re-design the Control Panel box so that the top surface may be removed, allowing access to the terminals and mounting-bolts from above. This solution, while such less desirable than a., could be accomplished with very much less effort, and could even be implemented as a retrofit effort at wing level.

Item 5.

The D.C. power connector is very difficult to install; organisational personnel report that installation time varies from fifteen minutes to as much as four hours:

The difficulty is considered to be due to the location of the connector, coupled with work-space problems.

The D.C. power cable is very large (approx. 3" dia) and is terminated in a special connector with a long rigid body. The socket is approximately 2 feet below the floor surface, close to the side wall of the pit.

Installation would be considerably eased if the D.C. power connector were to be re-located at the top of the Control Panel.

It is also possible that the bulky special connector could be dispensed with when the circuit-breaking modifications are incorporated in the LCC Motor Generator.

#### Item 10

Although each part of the M-G had a label, no serial number could be found for the combination of parts making up the Figure A 1367.

### Item 13

See item 5 concerning the D. C. power cable connector.

When replacing modules in the Control Panel it is necessary, according to paragraphs 1-40, et. seg., to remove wires from the terminal boards, and tag them for identification purposes. Such connections should be permanently identified to reduce the possibility

### Item 16

The comments in item 4 concerning packaging of the replaceable modules contained in the Control Panel could be considered as a deficiency in the Control Panel Cover; although the cover protects the equipment adequately, it also impedes access.

### Item 18.

On step q of Figure 1-10A, alligator clip leads are used to connect a test meter to the 120 vac 60 cycle buss and neutral. The leads specified terminate at the meter in a double "banana" jack. During the V&V observed, the technician transposed the leads in error, thereby grounding the live connection and burning up the test lead. No serious damage occurred, fortunately, but is is felt that the leads used for this test should be clearly distinguished.

# MAINTAINABILITY EVALUATION /OBSERVATION REPORT

| Report No. F0-1412-1               | Date 1-4-63                 | Page_    | 1082           |
|------------------------------------|-----------------------------|----------|----------------|
| Prepared by A. H. Smith            | M/s                         | 6207-1   | hone_ 866-3761 |
| Figure A No. 1472 Nomen Voice      | Reporting Signal Assembly   |          |                |
| Dwg. No. 10-21330-2                | Serial No                   | 0000001  |                |
| Observed Event Unsched. Maint. Loc | eationVAFB                  | Date_    | 1-4-63         |
| Title or Description Replacemen    | t of Faulty Audio Reproduce | r Module |                |
| 7.0. Procedures TCTO 21-SM80A-64   | 4                           |          |                |

|    |                         |     |    | ECKLIST                     |     |
|----|-------------------------|-----|----|-----------------------------|-----|
| 1  | Fault Isolation         | 4   | 14 | Lines and Cables            | 4   |
| 2  | Standardization         | 4   | 15 | Fasteners                   | 2   |
| 3  | Invershangeability      | 4   | 16 | Covers, Cases, Shields      | 4   |
| 4  | Packaging, Mounting     | 4   | 17 | Disposable Modules          | 4   |
| 5  | Accessibility           | 4   | 18 | Test Equipment              | 4   |
| ύ  | Work Space              | N/A | 19 | Servicing, Handling, Equip. | 4   |
| 7  | Testing, Servicing      | 3   | 20 | Tools                       | 2   |
| 8  | Displays                | N/A | 21 | Platforms, Stands, Shelters | N/A |
| 9  | Handles                 | 3   | 22 | Technical Order             | 4   |
| 10 | Labels, Marking         | 4   | 23 | Figure A                    | N/E |
| 11 | Controls                | 4   | 24 | Form B/C                    | N/E |
| 12 | Work Aids               | 2   | 25 | Specifications              | N/E |
| 13 | Connectors, Connections | 2   | 26 | Personnel Requirements      | 2   |

## CHECKLIST RATINGS

Good Maintainability

N/A Not Applicable

Satisfactory Maintainability

No Observation Possible

Unsatisfactory Maintainability

N/O N/E Not Evaluated

Poor Maintainability

Rating analyses are provided on succeeding pages, for all checklist items rated 3 or lever.

Item 7. When replacement of an Audio Reproducer Unit is required, present practice calls for removal of the message tape from the faulty unit, and its installation in the new unit. This process takes one hour to perform and also disturbs the environment within the unit. The work should be performed in an environmentally controlled area to prevent the inclusion of dust and other foreign matter in the tape mechanism.

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These requirements could be avoided and maintenance time saved if the Audio Reproducer Unit was fitted with a tape at the point of manufacture.

- Item 9. The unit weighs approximately 70lbs., and is labelled to this effect. The label also calls for a two-man lift. The unit is provided with a single hinged handle in the centre of the front panel, which invites single-man lifting. Two handles should be provided to avoid possible injury to personnel.
- Item 12. Electrical connections to the VRSA are made through a 100-pin connector, which is also used during fault-isolation as an access-point for probing. This activity could have detrimental effects on the reliability of the connector.

A proper break-out for access to the connector pins should be provided as a work aid.

Item 15. Printed Circuit Boards and Audio Reproducer Modules are attached to the chassis by means of Allen screws which are located close to the base of these items, approximately six inches deep. This geometry precludes the use of standard Allen wrenches.

The use of slotted screws for mounting purposes would allow the use of a normal screwdriver, and eliminate the need for a special Allen wrench tool. (See item 20)

- Item 20. Due to the use of Allen screws for mounting components to the chassis, and to the geometry (see item 15), technicians in the Contractor Support Area at VAFB have found it necessary to have a special long-handled Allen wrench manufactured. If the mounting method is not changed, then a special wrench should be provided.
- Item 26. Soldered joints are used extensively throughout the Assembly, resulting in the necessity for depot repair.

## MAINTAINABILITY EVALUATION/COORDINACOON REPORT

| sper  | 6 No. EO-1412-2           | Dete1-22         | -63           |                 | 3    |
|-------|---------------------------|------------------|---------------|-----------------|------|
| Prope | red by Ralph L. Stearns   |                  | x/s_50~       | 66 phone 6-626  | 3    |
| Figur | o A No. 1412 Nomen Signal | Assembly Voice   | Reporting     |                 | ,    |
| Dwg.  | No. 09821000 (10-21330)   | 80               | rial No. P-3  |                 |      |
|       | ved EventLoc              | · · · · ·        |               |                 |      |
|       | er Description Inspection |                  |               |                 |      |
| 7.0.  | Procedures                |                  |               |                 |      |
|       |                           |                  |               |                 |      |
|       |                           |                  |               |                 |      |
| ,     | · X                       | ADITAINABILITY O | HECKLIST      |                 |      |
| ,     | Fault Isolation           | N/A 14           | Lines and Cal | oles            | 4    |
| 2     | Standardisation           | 3 15             | Fasteners     |                 | 3    |
| 3     | Interchangeability        | 4 16             | Covers, Case  | , Shields       | . 4  |
| 4     | Packaging, Mounting       | 3 17             | Disposable Me | odules          | N/A  |
| 5     | Accessibility             | 2 16             | Toot Equipmen | nt ·            | 3    |
| 6     | Work Space                | N/A 19           | Servicing, H  | indling, Equip. | 4    |
| 7     | Testing, Servicing        | N/A 20           | Tools         |                 | 3    |
| 8     | Displays                  | 4 21             | Platforms, 8  | lands, Shelters | N/A  |
| 9     | Handles                   | 4 22             | Technical Ord | ier             | N/A  |
| 10    | Labels, Marking           | 4 23             | Figure A      |                 | N/A  |
| 11    | Controls                  | 4 24             | Form B/C      |                 | N/A  |
| 12    | Work Aids                 | N/A 25           | Specification | 38              | N/A  |
| 19    | Connections Connections   | 4 04             | Sensonal Se   |                 | 32/4 |

## CHECKLIST RATINGS

Good Maintainability

Satisfactory Maintainability

Unsatisfactory Naintainability

Poor Maintainability

X/A X/O X/S

Not Applicable No Observation Possible

Not Evaluated

Rating analyses are provided on succeeding pages, for all checklist items rated 3 or lower.

#### Item 2.

A special allen wrench, a standard allen wrench, two sizes of phillips screw drivers, and a common blade screw driver are required to perform maintenance.

### Recommendation

By standardization of the types of bolts the requirement for different hand tools could be minimized.

### Item 4.

The state of the s

7.

a. Due to the location of some of the mounting base mounting bolts several of the plug-in circuit boards have to be removed before their mounting base can be removed.

## Recommendation

Changing the location of the base mounting bolts would eliminate this problem.

b. Due to the location of the filter unit mounting bolts the plug-in circuit board mounting base must be removed.

## Recommendation

Changing the location of the filter unit mounting bolts would eliminate this problem.

### Item 5.

See Item No. 4.

### Item 15.

See Item No. 2

## Item 18.

Figure A 4539 Test Set, Voice Reporting Signal Assembly is connected to VRSA by a cable about four feet long and 2 1/2 inches in diameter. The stiffness of this cable makes the use of the test set very difficult.

## Item 20.

.. To remove the plug-in circuit boards and filter unit requires an allen wrench of greater than normal length.

# Recommendation

Changing the allen head bolts to slotted hex-head bolts would eliminate the requirements for a special tool.

## MAINTAINABILITY EVALUATION/COORNALION REPORT

| Report No. E0-3109-2  | Date_1                   | 17-63     | Pege        | 01_3     |
|-----------------------|--------------------------|-----------|-------------|----------|
| repared by A. H. Smi  | th                       |           | 6207-1 phor | 866-3761 |
| Figure A No. 3109     | Nomen Alarm Set Test-Set | AN/GSM-59 |             |          |
| Dwg. No. 25-26827     |                          | Serial No | 000015      |          |
| Observed Event None   | LocationVAFB             |           | Date1       | -17-63   |
| Title or Description_ | Static Evaluation        |           |             |          |
| 7.0. Procedures       | 33D9-137-2-1 (reference) |           |             |          |

|    | MAI                     | <b>NTA IN</b> ABILIT | Y CH | ECKLIST                     |    |
|----|-------------------------|----------------------|------|-----------------------------|----|
| 1  | Fault Isolation         | N/O                  | 14   | Lines and Cables            | 4  |
| 2  | Standardization         | 4                    | 15   | Fasteners                   | 2  |
| ٠3 | Interchangeability      | 3                    | 16   | Covers, Cases, Shields      | 4  |
| 4  | Packaging, Mounting     | 2                    | 17   | Disposable Modules          | N/ |
| 5  | Accessibility           | 4                    | 18   | Test Equipment              | N/ |
| 6  | Work Space              | N/A                  | 19   | Servicing, Handling, Equip. | N/ |
| 7  | Testing, Servicing      | 4                    | 20   | Tools                       | N/ |
| 8  | Displays                | 3                    | 21   | Platforms, Stands, Shelters | N/ |
| 9  | Handles                 | 4                    | 22   | Technical Order             | N/ |
| 10 | Labels, Marking         | 2                    | 23   | Figure A                    | N/ |
| n  | Controls                | 4                    | 24   | Form B/C                    | N/ |
| 12 | Work Aids               | N/O                  | 25   | Specifications              | N/ |
| 13 | Connectors, Connections | 1                    | 26   | Personnel Requirements      | 4  |

## CHECKLIST RATINGS

4 Good Maintainability

3 Satisfactory Maintainability

2 Unsatisfactory Maintainability

N/A Not Applicable

N/O No Observation Possible

N/E Not Evaluated

1 Poor Maintainability

Rating analyses are provided on succeeding pages, for all checklist items rated 3 or lower.

- Item 3. Two connectors on the rear of the Fault-Locator panel are identical, and appear to have the same keying. They are J9 and J11. Since they are adjacent, some confusion could arise, and the keying on one should be changed.
- Item 4. Test-set Antenna TS-1606/GSM-59 consists of a box, used for stowing cables, and a lid containing the Antenna Simulator. It is possible to get all the cables in the box, but the process requires ingenuity and patience. The problem is aggravated by a short tie-down strap (see Item 15). It is quite possible that the cables could be damaged by the sharp bends required if they were packed in intense cold. Damage to the cables could also occur due to the projecting handles on the panel of the Antenna Simulator in the lid. The only solution to this problem would appear to be enlarging the box or providing additional storage space.

The Antenna Simulator panel is secured to the lid by 28 screws, when 6 or 8 should be sufficient.

Item 8. The meter on the Fault-Locator panel has two scales, identified on the face of the meter as A and B. The Test Selector switch positions are referred to the appropriate scale by red or black dots, with a legend above the switch identifying the black dot as referring to the "Inner Scale", and the red dot the "Outer Scale".

The scales should be referred to as A and B to agree with the meter marking, and the dots should be replaced with the letters A and B. In time the dots will probably become obscured by dirt or wear, leading to possible confusion over test results.

Item 10. Each of the three boxes comprising the AN/GSM-59 weighs 90 lbs. or more but none are labelled to this effect. Warning labels should be affixed showing that two-man lift is required.

Each of the 17 cables bears a number of yellow labels with a confusing amount of "low significance" information. The identity and function of a cable is not immediately apparent, and attempting to find a particular cable in the pile can be irritating and time-consuming. The use of a differently colored label bearing nothing but the cable number and function in bold letters would be useful.

Item 13. The connectors provided on the cables were not apparently designed with exterior field use in mind.

All co-axial connectors require sultiple -turn installation, where quarter-turn connectors would have been more appropriate.

The 70 ohm co-axial connectors are particularly unsuitable, since they are the conventional laboratory variety which are very prone to becoming detached from the cable under conditions of rough usage. A molded type should be used, or at least one having an adequate cable-clamping device.

All the connectors, with one exception, are provided with loose plastic dust covers; these are very likely to disappear in time, leaving the connectors open to sand, dust, sud, and moisture. The dust covers should be of a captive variety.

Item 15. The lateral cable tie-down strap in the Antenna Test Set Group is too short at the buckle end. When replacing the cables after use, the buckle gets lost under the cables; this is very frustrating since recovery disturbs the carefully arranged cables.

The job of stowing the cables would be facilitated somewhat if this strap were to be lengthened by six inches.

### MAINTAINABILITY - HVALUATION / OBSERVATION REPORT

| Prepared by         A. H. Smith         M/8 6207-1 phone 866-37           Figure A No. 4043 Nomen Elevator Work Cage           Dwg. No. 25-18099 Serial No. 000007           Observed Event Repair Location VAFB-SMSB Date 1/25/63 | _3            |
|--|---------------|
| Dwg. No. 25-18099 Serial No. 000007  | 1             |
|  |               |
| Observed Event Repair Location VAFB-SMSB Date 1/25/63  | , <del></del> |
|  |               |
| Title or Description Replacement of damaged power cable.   |               |
| 7.0. Procedures  |               |

|    | жа                      | TAINABILIT | Y CH | ECKLIST                     |    |
|----|-------------------------|------------|------|-----------------------------|----|
| 1  | Fault Isolation         | N/E        | 14   | Lines and Cables            | 3  |
| 2  | Standardization         | N/E        | 15   | Fasteners                   | N/ |
| 3  | Interchangeability      | N/E        | 16   | Covers, Cases, Shields      | N/ |
| 4  | Packaging, Mounting     | 2          | 17   | Disposable Modules          | N/ |
| 5  | Accessibility           | N/E        | 18   | Test Equipment              | N/ |
| 6  | Work Space              | N/E        | 19   | Servicing, Handling, Equip. | N/ |
| 7  | Testing, Servicing      | N/E        | 20   | Tools                       | N/ |
| 8  | Displays                | N/E        | 21   | Platforms, Stands, Shelters | N/ |
| 9  | Handles                 | N/E        | 22   | Technical Order             | N/ |
| 10 | Labels, Marking         | N/E        | 23   | Figure A                    | N/ |
| 11 | Controls                | N/E        | 24   | Form B/C                    | N/ |
| 12 | Work Aids               | N/E        | 25   | Specifications              | N/ |
| 13 | Connectors, Connections | 2          | 26   | Personnel Requirements      | N/ |

### CHECKLIST RATINGS

4 Good Maintainability

N/A Not Applicable

3 Satisfactory Maintainability

N/O No Observation Possible

2 Unsatisfactory Maintainability

N/E Not Evaluated

1 Poor Maintainability

Rating analyses are provided on succeeding pages, for all checklist items rated 3 or lower.

Item 4. a. The power cable was damaged when the cable-drum failed to reel in the slack while traversing, resulting in the elevator running-over the cable. To remove the power cable from the drum it was necessary to chip away a hard "potting" compound which surrounds the cable as it passes through the "axle" of the drum. This process is time-consuming and dirty.

The reason for using the compound is obscure; the likeliest explanation is that it is used to prevent moisture from entering the drum.

#### Recommendation:

. . . . .

An alternative method of sealing the aperture should be employed. Possibly a connector should be placed at this point with a mechanical clamp to prevent cable movement.

b. On the unit observed it was apparent that the relay-box was breaking away from its fasteners and will eventually break loose. The structure: is supported as a cantilever with rivets or bolts at the bottom end.

#### Recommendation:

The relay box should be braced at the top end, possibly by adding a strap between the relay box and winch motor housing.

when the cable-reel is removed the tension in the re-wind spring must be released by removing the power cable connector and allowing the end of the cable to pass through the nylon guide-wheels and around the drum. If the drum is not held tightly, it unwinds rapidly, and the rewind spring becomes disengaged from the "axle". It is then necessary to open the spring mechanism to relocate the inner end of the spring into the slot.

#### Recommendations

The innermost turn of the rewind spring should be slightly smaller in diameter than the axle, so that it will automatically re-engage upon rotation of the drum.

It is not possible at present to check-out the elevator mechanism at the SMSA because the power cable connector does not fit any existing power outlet.

#### Recommendation:

A spare Power and Communications Distribution Box (GS-3508) should be provided for the Support Area to facilitate check-out of the elevator mechanism.

Item 14. When replacing the power cable, it is necessary to disconnect the cable from the slip-ring mechanism.

The leads from the slip-rings are all white, resulting in the necessity to draw a diagram to ensure correct replacement.

### Recommendations

The leads from the slip-rings should be color-coded to agree with the color coding of the power cable.